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AUTOMOTIVE AND TRACTOR INDUSTRY

COSTS OF OWNING AND OPERATING A CAR ANALYZED

Moscow ZA RULEM in Russian No 7, 1979 signed to press 28 May 79 pp 14-15

Article: "How Much a Kilometer Costs"

Text Today there are many people sitting behind the wheel of a car who do not use a car in their work and frequently have no knowledge of machinery. This is unfortunate, but is one of the inevitable consequences of increased automobile production. According to sociological studies conducted recently in Leningrad and its environs, over 90 percent of Zhiguli owners fall into this category and only 9 percent of the motorists are directly involved in driving, servicing and repair of motor vehicles. This is why explanations of such concepts as vehicle reliability and cost of operation are so important to the public.

We will discuss everything one by one in the necessary detail, but first we feel it necessary to show how the design and quality of vital parts, in other words, the efforts of the plant, affect operating costs, and what is left up to the owner himself.

The studies for this article were made on two groups of VAZ-2101 vehicles: 106 1971-1972 models and 201 1973-1974 cars. Such a breakdown was used because a series of design and engineering changes was introduced at the Volga Motor Vehicle Plant in 1973 which were directed at increasing the quality and reliability of the cars. Both groups of vehicles were observed for 50,000 km which corresponds to three-four years of operation.

The front and rear suspension, electrical equipment, brake system, engine, and rear axle represent the most critical areas on the VAZ-2101 in respect to reliability. The reports on early Zhigulis indicated that the most common failures occurred in these systems. As a result, the improvements in their reliability introduced at the plant had a direct effect on repair costs for car owners. While in the first group of cars the replacement of ball joints represented 38.7 percent of total expenditures for front suspension repair, in the second group the figure was only 27.5 percent. In 1971-1972 models the seal assemblies of rear shock absorbers "ate up" 92.6 percent of rear suspension costs. Later on the figure fell to 86.4 percent.

The most common electrical system failures in group one vehicles were cracks in the battery casing and corrosion of battery plates, plus breakdowns in odometers, speedometers and temperature gages. These represented 60 percent of the total expenditures made on electrical equipment. On vehicles in the second group less than half this amount or 25.4 percent of the money went for eliminating these types of problems.

The wearing of camshaft cams and valve rocker arms is still being encountered. But while the solution to these problems required 85.6 percent of the total expenditures on engines, afterwards this figure was reduced to 46.5 percent and is continuing to fall.

The wearing of brake shoes to a greater degree than the brake piston cups on the front brake supports depends on one's style of driving. These two items represented 57.5 and 25.8 percent respectively of total brake system expenditures in the first group.

The main complaints about the rear axle were gearbox noise and wearing of axle shaft bearings.

These six listed units and systems of the VAZ-2101 accounted for 84.5 percent of all money spent by the car owners for service and repair during the 50,000 km. Table 1, which lists these figures, provides an accurate way of forecasting future expenses and how they apply to a car under various road conditions. To overload one's car or not, to travel on dirt roads at 70 kph or 50 kph, and to keep an eye on the battery or buy a new one every year - these and other considerations obviously will be of help to an owner.

Table 1 Repair Costs for Systems of 1973-1974
VAZ-2101 Cars for First 50,000 Km

Units and Systems	Expenses (Percentage)
Front suspension	22.5
Electrical equipment & instruments	21.4
Engine and its systems	8.8
Brake system	11.3
Rear suspension	10.8
Rear axle	10.0
Body and its parts	6.4
Steering system	0.9
Wheel disks	3.3
Clutch	3.2
Universal	1.3
Transmission	0.1
Total	100.0

A list of car parts and assemblies which represent the main expenses in maintaining a vehicle in good working order is given in Table 2. It includes the parts which are the most expensive and most suitable for repair and replacement, as well as other parts which have a higher incidence of failure. It should be noted that these parts account for 78.2 percent of the vehicle repairs.

Table 2 Expenditures for Parts and Assemblies of 1973-1974 VAZ-2101 Cars for Maintaining Proper Operation

Parts and Assemblies	Average Life Expectancy (in thousands of km)
Front brake shoes	25-45
Rear shock absorber liners	30-40
Rear shock absorber	35-50
Upper ball joint	35-50
Spark plug	40-50
Ignition switch	45-70
Front shock absorber bushings	45-75
Fan belt	50-60
Front shock absorber	50-60
Battery	50-70
Lower ball joint	50-70
Wheel brake cylinder	50-70
Rear brake shoes	55-75
Camshaft	60-70
Front suspension arm bushings	60-80
Universal joint	60-80
Wheel disk	60-90
Front suspension lower arm	75-90
Windshield wiper motor	75-95
Clutch driven plate	80-110
Clutch driving plate	120-150
Generator diode board	120-150
Axle shaft	120-160
Front brake support	150-180
Rear axle reduction gears	160-190

The rather long life and good working of these parts and assemblies were developed based on road and test data accumulated by the plant. Of course, in actual use the situation is somewhat different.

An analysis of the causes of premature part failures showed that how a car was handled and where it was operated were key factors. Thus, the length of service of shock absorbers, ball joints, and front suspension rods depends a great deal on proper driving speed, while the life of the camshaft and valve rockers is dependent on the expansion gap and proper engine

operation. The life expectancy of clutch plates and brake system parts primarily depends on the manner in which a motorist operates his car and his skill level. The life of the battery directly corresponds to the care and maintenance given it and the adherence to servicing rules. Thus, the driver himself is mainly responsible for the proper operation of his car and determines how much is spent on keeping it in good working order.

The ability of a family to balance its income and outflow is just as important as for an enterprise, although the scale, of course, is considerably different, and it requires the capability of clearly understanding each area of expense. Without this there can be no rational approach to reducing them.

Operating costs for a privately owned vehicle are calculated according to the formula:

$$C = C_a + C_t + C_{to} + C_r + C_g + C_{sh}$$

which sums up the following expenditures: C_a - depreciation; C_t - gas; C_{to} - servicing and operating needs; C_r - routine repairs; C_g - maintaining a garage-parking space; and C_{sh} - tires.

Depreciation deductions for the VAZ-2101 are determined by norms approved by the Council of Ministers USSR 14 March 1974, are the same for the whole country, and are equal to 0.36 percent of its value (for the owner — the price) per 1,000 km of mileage. Reducing this to the customary 100 km figure, we come up with a C_a of 1.98 rubles/100 km or 198 kopecks/100 km.

Fuel costs are based on the price of fuel (T_{st}), which for AI-93 gasoline is 20 kopecks/liter, and gas consumption (Q), which for a privately owned VAZ-2101 is 10.3 liters/100 km. Placing these figures in the formula $C_t = T_{st} \times Q$, we get 206 kopecks/100 km.

Expenditures for servicing and operating needs C_{to} include the price of parts replaced during regular servicing (T_{s2d}), the price of work itself (T_{sto}), and operating items (T_{sem}). All three values are determined based on an approved schedule for periodic servicing based on coupons from the service booklet with standard outlays of transmission and motor oil, lubricants and other fluids. As a result we get the following average figures: for parts replacement during regular servicing - $T_{s2d} = 41.8$ kopecks/100 km; for work during servicing - $T_{sto} = 24.9$ kopecks/100 km; and for operating needs - $T_{sem} = 8.3$ kopecks/100 km which total 75 kopecks/100 km.

Outlays for routine repairs on a vehicle (C_r) come from the price of replaced parts (T_{sd}) and labor costs related to their replacement (T_{sr}), i.e. $C_r = T_{sd} + T_{sr}$. Both component formulas were based on observations made on VAZ-2101 vehicles in Leningrad and vicinity and were found to be $40.5 + 12.8 = 53.3$ kopecks/100 km.

In the expenses for maintaining a garage-parking space are also included payments for all types of taxes and fees related to operating a vehicle. Putting everything together it turns out that the amount of these costs is proportional to the length of the car (l) and inversely proportional to the annual mileage (L) or $C_g = \frac{K}{L} \times l$. Assuming the proportionality con-

stant (K), for a privately owned vehicle is 10^5 , the length of the vehicle is 4.07 m, and the average annual mileage is 15,000 km, we come up with $C_g = 27.1$ kopecks/100 km.

Money spent for tires is established by a special formula and for a passenger car with five wheels (counting the spare) amounts to 0.01 percent of the price of a tire, or $C_{sh} = 0.67$ rubles/100 km or 67 kopecks/100 km.

All that remains is the adding up of the expenses and this is done in Table 3.

Table 3 Average Costs for Operating a Privately Owned VAZ-2101 Car over a One Year Period	
Expense Category	Expenses in kopecks/100 km
Depreciation	198.0
Fuel	206.0
Servicing and operating items	75.0
Routine repairs	53.3
Garage-parking space	27.1
Tires	67.0
Total	626.4

Thus, in the first three to four years the cost of each 100 km for a privately owned VAZ-2101 is in the vicinity of 6 rubles and, assuming an annual mileage of 15,000 km, roughly 900 rubles would be a good amount to set aside for this purpose in the family budget.

The personal experience of Muscovite V. Abramov confirms the results of the special research. His letter to the editors is being printed in full.

Over a three year period I totalled all my expenditures for maintaining a car. My new VAZ-2101 was purchased in January 1974. All operations involving adjustments, regular service and repair were carried out at a service center. The simplest work (replacing lights and fuses, adding oil and water, etc.) was excluded. There were no serious breakdowns. The mileage in 1974 was 21,000, in 1977 - 21,000, and in 1978 - 18,500 km. Some 80 percent of this was on hard-surfaced roads and 20 percent on dirt roads. Half of the mileage was in the city. The car is not kept in a garage, but it is under an awning.

I broke down all operating costs into eight categories (Table 4) and I used 1972 price information.

Under "Spare parts and added equipment" are included the acquisition of a fairly complete spare parts kit and items which are needed to take on the road. For example, this includes a tent, locks for the wheels and gas tank, an anti-freeze device, a device to quickly remove the outside mirror, seat covers, rubber mats, a winch, luggage carrier, a selection of bolts, distributor cap, points, and spare bulbs and fuses. The whole set of tires (under this same category) was changed during the third year after 47,000 km of use.

Table 4. Operating Costs for V. Abramov's VAZ-2101 Car

Cost Category	Per Year Average	
	Rubles	Percent
AI-93 gasoline	385.6	45.8
Oil	4.7	0.6
Spare parts and added equipment	204.0	24.2
Regular servicing at service center	143.3	17.1
Car improvements	7.7	0.9
Payments for minor repairs (not at service center)	23.0	2.7
Insurance fees, taxes, inspections	61.0	7.2
Miscellaneous expenses	12.7	1.5
Total	842.0	100.0

The price of seven regular services as recommended by the plant is included in the "Regular servicing at service center" category. Here also are entered expenses for treating the car with "Tektil" and replacing the thermostat, one headlight, the window-crank on the left front door, and the battery.

Under the "Car improvements" category I included the purchase and use of paint and varnish products for covering and chrome-plating body parts.

The need for minor repairs and adjustments occurred between times for regular servicing at service centers. For example, the brakes were adjusted, the points were replaced, the carburetor was cleaned and adjusted, etc. This work was performed outside of the service center at non-official prices.

Some money was spent for the voluntary insuring of the car (for 3,000 rubles), as well as for the compulsory motor vehicle taxes and inspection fees.

I treated the annual entrance fees for the "Avtomotolyubitel'" society and fines for traffic violations as "Miscellaneous expenses."

Thus, my average annual costs for operating my own car came to 842 rubles, or 70 rubles plus on a monthly basis. I maintain my average gas consumption at a level of 9.6 liters/100 km. Disregarding car depreciation the cost of each 100 km was 4 rubles 20 kopecks.

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AUTOMOTIVE AND TRACTOR INDUSTRY

MOTOR VEHICLES USING NATURAL GAS INSTEAD OF GASOLINE

Ashkhabad TURKMENSKAYA ISKRA in Russian 4 Jul 79 p 4

[Interview with V. A. Burlakov, head mechanic of the Krasnovodskoblgaz Association, by N. Sukhomozskiy: "Gas Instead of ... Gasoline"]

[Text] The motor vehicle moved smoothly through the streets of the coastal city. A little farther -- and the nervewracking confusion, traffic lights and traffic cops are left behind. Ahead are endless expanses of Karakumy, the long road into the zone of the southern subtrories. A special vehicle will deliver "blue fuel" to the remote settlements of the oblast.

"Let's get out and refuel," the driver, G. Starostenko, said out loud, turning onto Ulitsa 1 Maya.

We pass block after block. A gasoline pump flickered in the side mirror. "Where are we going?" the question almost jumped from my tongue. The driver, understanding, smiled: he said that was an old custom.

In the meantime the motor vehicle had rolled up to the gas shop of the Krasnovodskoblgaz Association and stopped next to a reservoir with an unusual shape. After a couple of minutes the driver gave the well-known command, "Let's go."

There are only three motor vehicles in the oblast that operate on compressed gas instead of gasoline. They belong to the Krasnovodskoblgaz Production Association. Our correspondent, M. Sukhomozskiy, met with the enterprise's head mechanic, V. A. Burlakov, and asked him to answer a couple of questions:

[Question] Viktor Alekseyevich, what are the technical and economic data of the gasmobile as compared to the ordinary gasoline vehicle?

[Answer] As many years of research by specialists and our observations have shown, the gas engine is somewhat inferior to its predecessor. But

not very much: Depending on the make, the motor vehicle's load is 250-400 kilograms less and it loses 5-8 kilometers in speed. The distance of travel between refuelings, with one tank or cylinder, is the same -- 250-270 kilometers. But the innovation undoubtedly has the advantage in another sense -- the fact that the fuel is inexpensive and environmental pollution, minimal. One car alone produces an average savings of 10,000 rubles a year. If you consider that we have more than 30 motor vehicles, it is not difficult to figure out what the "gain" would be: more than a quarter million rubles a year. And I am not even speaking about the large automotive enterprises that have a large number of motor vehicles.

[Question] Despite the token disadvantage in the cargo capacity and speed, the advantages of the gasmobile are obvious. But how reliable are they to operate?

[Answer] The responses from drivers are most favorable. There is nothing surprising in this. The gasmobile does not need a carburetor, which requires regular careful service. The efficiency factor of the engine is also high -- it is less subject to overheating and simple to service. By installing additional gas cylinders, one can increase the distance the vehicle runs without refueling to 1,000 kilometers.

And if something unforeseen happens anyway, the driver simply installs a carburetor which he carries with him, and continues his journey with regular gasoline. Each of our drivers has a spare tank of fuel.

[Question] Viktor Alekseyevich, which plant produces gasmobiles?

[Answer] I have heard that the Gor'kiy plant does. But we transformed our own vehicles. We obtained everything we needed from the Ryazan' automotive equipment plant. This job is not complicated. We spent a week on the first vehicle and the second took little more than 2 days. The drivers G. Starostenko and I. Ivashechkin and the electric welder N. Khafizov worked especially hard. We have a total of three gasmobiles in operation. Two more will soon appear on the roads of the oblast.

[Question] What, in your opinion, is the future of the innovation and how soon will gasmobiles become popular?

[Answer] I had occasion to discuss this subject with specialists of other enterprises. The interest in our experiment is understandable. I will not be mistaken if I say that many people are less suspicious than they were. More and more people are coming out in favor of the gas engine. But here is a problem -- so far there is not a single gas refueling station in the republic.

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CHEMICAL INDUSTRY AND RELATED EQUIPMENT

STATISTICS FOR USSR CHEMICAL INDUSTRY PRESENTED

Moscow AGITATOR in Russian No 8, 1979 pp 25-27

Article: "At Outstripping Rates"

Excerpts The efficiency of chemicalization of the national economy. As a result of the increase in the deliveries of mineral fertilizers, in 1975 the net income in agriculture totaled almost 3.5 billion rubles and by the end of 1980 it will reach approximately 6.5 billion rubles.

On the average, chemical plant protection agents annually preserve about 19 million tons of grain, up to 10 million tons of sugar beets, 1.3 million tons of raw cotton, 5.6 million tons of potatoes and about 6 million tons of fruits and berries—in all, worth about 4 billion rubles with total expenditures of 450 to 500 million rubles on chemical protection.

Each ton of carbamide added to the rations of cattle represents 10 additional tons of milk or 500 kg of meat. Each ruble spent on feed phosphates brings 10 to 20 rubles of profit to farms.

A ton of polymer film provides more than 4,000 rubles of annual savings for agriculture. As a result of the use of this film, the expenditures on the construction of hothouses are lowered to a fourth or fifth.

The use of plastics during the Ninth Five-Year Plan made it possible to save 1.2 million tons of ferrous and nonferrous metal, about 5 million cubic meters of timber and up to 3 million tons of other traditional materials.

A total of 3,870 rubles in instrument making and 1,810 rubles in electrical engineering--this is the economic benefit from the use of each ton of plastics. One ton of plastics in the production of machinery saves more than 5 tons of steel and cast iron. In ship building 1 ton of polymers replaces 3 to 4 tons of steel or 5 to 6 tons of copper alloys.

Chemical fibers make it possible to save thousands of tons of cotton, wool, flax and silk. According to calculations, the replacement of natural fibers with chemical fibers will make it possible to save more than 7 billion rubles during the 5-year period.

As a result of the increase in chemical output alone, in 1980 the economic benefit (in the national economy) will total approximately 12.5 billion rubles and the increase in profit, almost 5 billion rubles. All the expenditures connected with the development of the chemical industry during the Tenth Five-Year Plan will be recovered in less than 3 years.

The production capacity of chemical sectors greatly increased at the expense of new construction during the Tenth Five-Year Plan.

Comrade L. I. Brezhnev, secretary-general of the CPSU Central Committee, chairman of the Presidium of the USSR Supreme Soviet, warmly congratulated the participants in the construction of the following:

the Novodzhambul Phosphorus Plant, which will accelerate the development of vast natural resources, that is, the Karatau phosphate ores in Kazakhstan;

the Chardzou Superphosphate Plant imeni V. I. Lenin, where a complex for the production of sulfuric acid of an annual capacity of 450,000 tons was put into operation;

the Odessa Port Plant, where the first stage was put into operation. It includes a unit designed for an annual output of 450,000 tons of ammonia;

the first complexes for the production of liquid fertilizers and sulfuric acid in the country in the Sumy Khimprom Association;

the third stage of the Almalyk Chemical Plant, which will give kolkhozes and sovkhozes thousands of tons of ammophos--a highly effective complex fertilizer. The plant personnel committed themselves to master the introduced capacities twice as rapidly as the standard period;

the largest facility for the production of acrylonitrile of an annual capacity of 150,000 tons in the country in the Saratov Nitron Association. The new production facility will make it possible to increase the output of this valuable product more than sevenfold;

the new complexes of the Apatit Production Association of an annual capacity of 1.3 million tons of apatite concentrate and 4 million tons of apatite-nepheline ore;

the first stage of the Pavlodar Petroleum Refining Plant.

The output of fertilizers has begun at the first stage of the Fourth Soligorsk Potassium Combine. When it operates at full capacity, more than one-half of the potassium fertilizers in the country will be produced with the trademark of the Beloruskaliy Production Association. Units for the production of liquid ammonia were put into operation at the Tol'yatti Nitrogen Plant. Its output will be transported along the "fertility routes"--the Tol'yatti-Odessa ammonia pipe, which is more than 2,400 km long.

In 1978 a total of 99 enterprises and production facilities replenished the petroleum refining and petrochemical industry. They include a complex for petroleum refining at the Kremenchug Petroleum Refining Plant and large facilities for the production of phenol at the Ufa Synthetic Alcohol Plant, of isoprene rubber in the Nizhnekamskneftekhim Association, of automobile tires in the Bobruyskshina Association and of molded and nonmolded industrial rubber articles in the Balakovorezinotekhnika Association.

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CHEMICAL INDUSTRY AND RELATED EQUIPMENT

PERVOMAYSK CHEMICAL PLANT NEAR KHAR'KOV DESCRIBED

Moscow STROITEL'NAYA GAZETA in Russian 20 Jul 79 p 3

Article by V. Smetanin, chief of the Administration for Planning and Capital Construction of the Ministry of Chemical Industry: "Pervomaysk Complex"

Excerpts One of the largest facilities for the production of chlorine and caustic soda by the method of diaphragm electrolysis of table salt in Europe was established at the Pervomaysk Chemical Plant near Khar'kov. Its capacity is 2.5 times as much as that of similar enterprises existing in the country. The complex output forms the basis for obtaining a number of key chemical derivatives, that is, plastics, solvents, toxic chemicals and disinfecting materials, and is also widely used in other industrial sectors. The complex was established according to the plan of Soviet specialists and is fully fitted with Soviet equipment.

For example, it is well known that electrolyzers with graphite anodes, which even in the best apparatus served no more than 9 months, were used during decades for the production of chlorine and caustic soda. To replace anodes and to again put electrolyzers into operation is not a simple matter. It was necessary to operate by means of hammers, to knock out concrete and bitumen, then to heat bitumen to 200 degrees and to again create a protective anti-corrosion layer within the apparatus.

Electrolyzers with metal oxide anodes were used on a large scale at the Pervomaysk Chemical Plant for the first time in Soviet practice. A thin oxide film applied to exceptionally stable metal--titanium--now performs the role of graphite and, it should be stated, has performed it correctly during 4 to 6 years. Long-life Soviet anodes have been patented in many countries.

Structural perfection is not the only advantage of the new electrolyzers. The labor productivity of the service personnel increased considerably. The plant is able to annually save about 1,500 tons of high-quality graphite for anodes and up to 20 million kwh of electric power.

The new equipment and industrial processes were calculated by means of electronic computers, which made it possible to shorten planning periods.

The introduction of 15 inventions and more than 50 efficiency proposals produced a total economic benefit of about 2 million rubles annually.

For example, electrolysis, transforming substation, chlorine compression and electrolyzer repair departments are blocked in the main production building. The refrigerating station is blocked with the department for chlorine liquefaction and with the liquid chlorine warehouse and the evaporation department, with brine purification. As a result, the construction area was reduced by 25 percent, the length of utility lines was shortened and heat losses and the expenditure of building materials were cut down.

A significant part of the equipment (electrolyzers, evaporators, systems for drying and liquefying chlorine and warehouses for lyes, caustics and so forth) is located on open grounds, under an awning or in light-weight unheated buildings. This lowered the expenditure of materials not only on enclosing structures, but also on foundations. Operating expenditures on the maintenance of buildings were lowered respectively.

At all the stages of construction and installation it was possible to shorten the periods of work considerably and, as a result, 7.5 months were saved.

In fact, capital expenditures on the establishment of the complex are lower than the planned expenditures and the specific expenditures are lower than in other similar plants. The production facility operates profitably and the attained production costs are slightly lower than the planned production costs. The liquid chlorine produced here was certified with the state Badge of Quality.

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CHEMICAL INDUSTRY AND RELATED EQUIPMENT

CONSTRUCTION DELAYS AT YAROSLAVL' SYNTHETIC RUBBER PLANT

Moscow STROITEL'NAYA GAZETA in Russian 15 Jul 79 p 1

[Article: "There Was One Object at Yaroslavl'"]

[Text] The production complex of the synthetic rubber plant was not turned over to the customer last year. A pledge was adopted to turn it over in April of this year and they did not keep their word. This was the only large starting object of the construction industry in the city. What interfered with introducing it within the deadline? The following is the answer to this question to correspondent of STROITEL'NAYA GAZETA V. Avtonomov.

A. Shevlyakov, chief of the Department on Construction of Enterprises of the Petroleum Refining, Petroleum Producing and the Paper and Pulp Industry of Minstroy [Ministry of Construction] of the USSR says:

"If one is objective, the general contractor -- the Yarkhimpromstroy Trust [Expansion unknown] of Glavverkhnevolzhskstroy [Expansion unknown] of our ministry -- is guilty of this. The managers of this trust do not know how to organize the work on the construction project in the proper manner and coordinated the actions of related organizations unsatisfactorily. Moreover, there was a shortage of work force here."

"Of course, the ministry adopted measures to accelerate startup. The problem of its construction was considered repeatedly at different meetings and specific measures were planned. A representative of the ministry -- the deputy chief of the Department of Construction in Yaroslavskaya Oblast A. Agapov was at the construction site for more than 1 month. The first deputy minister R. Sakaluskas also went there and held meetings."

• "Starting-adjusting work is now under way at the complex. We expect introduction of it in August-September."

Incidentally, a new manager of Yarkhimpromstroy Trust and a new chief of Glavsrrednevolzhskstroy [Expansion unknown] have now been named."

Yu. Sivakov, chief of the Administration of Planning and Capital Construction of Minneftekhimprom [Ministry of the Petrochemical Industry] of the USSR, says:

"To start up the capacity in April (the second deadline!), the builders were supposed to complete work worth 1.8 million rubles during the first 3 months of the year, but they completed work worth 1.2 million rubles during 5 months. It is as though the total underfulfillment is low and incomplete work is insignificant: the approaches are not prepared, measures have not been fulfilled on fire safety and development of the territory has not been completed. But after all, it is impossible to put the complex into operation without these seemingly 'minor' details."

"I feel that the general contractor here tried to work at 'their leisure' rather than for starting. And the workers from Minmontazhspetsstroy [Ministry of Installation and Special Construction Work] of the USSR, specifically the heat insulation workers, also did not hurry."

"Moreover, no one interfered with the Yaroslavl' builders and installers in introducing the important complex into operation on time. All the equipment (with the exception of a single item, which did not affect the course of matters and was received in December) was delivered within the deadline. The Yaroslavl' workers also did not complain about issuance of technical documentation. The entire misfortune is in poor organization of construction."

This is a frequent pattern: different meetings, protocols, departures of responsible workers to the sites are more than sufficient, but matters proceed poorly. This means that the personal responsibility of the managers for the entrusted matter is primarily low. The second thing is that the administration planning system and economic stimuli must be improved; they now sometimes push for pursuing advantageous volumes of work.

A few days ago, the board of Minstroy of the USSR analyzed the course of construction in Yaroslavskaya Oblast, including the synthetic rubber plant. Whether this discussion helps the course of matters only time will tell.

6521
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CHEMICAL INDUSTRY AND RELATED EQUIPMENT

EVALUATION OF USSR CHEMICAL FERTILIZER INDUSTRY

Moscow PRAVDA in Russian 14 May 79 p 2

[Article by I. Totskiy and V. Shilov: "Fertilizers and Yield"]

[Excerpts] A Guarantee of Fertility

When a conversation was held 14 years ago at the March Plenary Session of the CPSU Central Committee on measures to intensify agricultural production, the most serious attention was devoted to increasing the output of mineral fertilizers. Construction of new fertilizer complexes was soon organized in many regions of the country and technical re-equipping of enterprises was begun. The machine builders organized output of production lines and units for fertilizer production, the unit capacity of which exceeds the then-existing capacities by a factor of 10-20. The labor productivity at these installations has been increased by a factor of 8-10. The mining sectors provide the chemical industry with more economical raw material -- gas and petroleum products.

Why do not mineral fertilizers always provide a return with a sound harvest? There are many reasons for this: the delivery deadlines and regulations for storage and application of fertilizers are disrupted. They are frequently applied without regard to the needs of the soil, visually, without preliminary liming of the fields. The farm managers and agronomists are of course the guilty parties here who have not yet learned how to evaluate each kilogram of nutrients.

Past the Field

Due to the fact that the production chain for moving the fertilizer granules from the supplier to the farm has not yet been finally worked out, their losses sometimes reach more than 10 percent. What is the reason? Liquid fertilizers frequently begin their route from the plant conveyor in unadapted rail cars. Until it is delivered to the customer, the freight is converted into a single solid piece. It is broken up with crowbars or sledge hammers and a caterpillar is sometimes used. The expenditures are rather significant -- each ton of caked fertilizers "eats up" 2-3 rubles.

As is known, fertilizers are applied seasonally. Warehouses are required for their storage and processing. This is one of the weak links in the system of the agrochemical service. There is clearly a shortage of storehouses. The fertilizer granules are frequently piled under sheds. The open sky is sometimes this "shed." The rain pours. The eroded salts float past the field: into ravines, gulleys and reservoirs. It is easy to calculate what this mismanagement means: Having lost a kilogram of nutrients, the farmer is short 4 kilograms of grain or 3 kilograms of cotton in the fall.

Moreover, a unified scheme for disposition of large mechanized warehouses has been worked out. However, construction of them is proceeding extremely slowly. Last year is confirmation of this. Whereas the plan for introducing storehouses was realized by 84 percent on the kolkhozes, they have fulfilled it by only 60 percent on the sovkhozes and associations of Goskomsel'khoztehnika.

The chief of the Central Chemization Board of the Ministry of Agriculture of the USSR A. Artyushin explains that the contracting organizations of Minstroy [Ministry of Construction] and Minsel'stroy [Ministry of Rural Construction] of the USSR have no special desire to construct warehouses. Of course, this is not advantageous to them. The kolkhozes and sovkhozes must frequently count on their own forces. And "self-construction" is much more expensive and its quality leaves much to be desired.

There is yet another weak link in the conveyor along which the fertilizers travel from the plan to the field: application of them to the soil. The machines with which the fertilizer detachments are equipped are of low productivity and it is difficult to achieve uniform scattering of the fertilizers when using them. Nonuniform application of fertilizers reduces yield by 6-10 percent. The farmers have long been waiting for the promised highly productive scattering machines and the 60-ton fertilizer mixing unit. But these machines enter the conveyor only this year and the self-contained PEA-1.0 loader, recommended for production, is not being started into serial production. The machine builders are not hurrying, although the new technology is very much needed: It would permit not only an increase of plowed land productivity, but would also significantly reduce production expenses.

Reserve Capacities?

Since the beginning of the five-year plan, the chemists have shipped approximately 26 million tons of fertilizers -- considerably more than during the same previous period -- to improve the fertility of the fields. And even so, the rates of growth of fertilizer production, determined by the 25th CPSU Congress, have not yet been reached, and the sector is indebted to the kolkhozes and sovkhozes for more than 10 million tons of vitamins for the fields. The great industrial potential is frequently being unsatisfactorily utilized. More than half of the enterprises introduced during the past few years have not reached the stable design level. The Ministry of the Chemical Industry can raise the annual fertilizer output by 13.7 million tons with total loading of the units.

The low output of many fertilizer plants is most frequently explained by "insufficient qualifications of maintenance personnel." The average qualification category of sector workers is lower than required by a growing technical level of production. The Ministry of the Chemical Industry is allocating very few funds for improving the training of personnel. But they are also being assimilated by only 50-60 percent. The saving on the academic base is thousands and Minkhimprom is losing millions of rubles on equipment idle times.

More than 80 percent of the chemists' debt is phosphate fertilizers, the very fertilizers which agriculture especially needs. The explanation is a disproportion in the production of integrated products. In erecting "assembly conveyors," the chemists are poorly concerned about developing a raw material base and procurement shops.

The deputy minister of the chemical industry A. Novikov, responsible for phosphate fertilizers, clearly outlines the reasons for the developed situation. But, when the conversation touches on how to achieve balanced production, the interlocutor, except for general phrases, cannot say anything. It seems that there is no specific constructive program in headquarters in this regard. And the question has already been raised here about the quality of management at higher levels.

The problem of increasing the effectiveness of utilizing state-allocated funds is of key significance for improving the work of the sector. Giving a speech in 1975 at the Second All-Russian Conference on Chemization of Agriculture, the minister of the chemical industry L. Kostandov said that the program of increasing the output of mineral fertilizers can be fulfilled provided that the annual introduction of plants and shops capable of producing 10-12 million tons of fertilizers is effective.

However, the ministry itself, its own calculations notwithstanding, postponed 80 percent of the starting program to the second half of the five-year plan. Alas, we are summoning our forces and then we "begin jerking." It turned out otherwise in fact. The three-year task has not been fulfilled by half. The "incompleted" plan has increased by a factor of 1.5. Uninstalled equipment worth 1.64 million rubles has accumulated. And this is what happened. By the beginning of last year, plans for 160 new plants were worked out according to the task of the sector headquarters. They began to order materials and equipment for them. Only 25 construction projects were included in the plan.

This practice of dispersal of forces clearly contradicts the general course to increase the efficiency of management. The impression is created that, having had enormous funds at its disposal for many years, the Ministry of the Chemical Industry sometimes loses the account of government rubles.

The fertilizer industry must be raised to a qualitatively new level. A number of complex problems is also faced by the ministries and planning

organs. Let us say, the chemists are now producing six marks of complex solid fertilizers. In the opinion of scientists, the variety must be at least doubled. But the producers are extremely unwillingly involved in this: the expenditures and concerns are increasing, while another sector -- farming -- achieves a visible economic effect.

The same thing is also occurring with production of highly concentrated salts. The specific weight of nutrients in them now comprises approximately 36.5 percent. In practically every railway train, 63 of 100 rail cars are loaded with ground rock. The cost of shipping each ton is approximately 10 rubles. It is easy to calculate how much transport of ballast is costing the country.

A task has been posed to the chemists -- bring the content of useful matter in fertilizers up to 40-43 percent. As indicated by domestic experience and foreign practice, the technology used makes it possible not only to achieve, but also to exceed this level. True, an additional tens of millions of rubles must be expended to readjust and improve production. They are returned rapidly and with a bonus. But again for the related workers and consumers. The chemists understandably prefer an increase of "tonnage." In the final analysis this has a boomerang effect: Production must be slowed down due to a shortage of rail cars.

The national economic effect is usually calculated very unwillingly in agency accounts. This is the prerogative of Gosplan of the USSR and of the state All-Union committees. They have been called upon to aim the economic interest of the different ministries toward the final economic results rather than toward intermediate sector results. A complex of economic measures is necessary. Let us say if the chemists are not paid for the total weight of the fertilizers but for the content of nutrients in them, this will inspire them to more vigorously organize the output of highly concentrated fertilizers. Thousands of rail cars will be released and expenditures for storage and application of fertilizers will be sharply reduced. On the other hand, the material incentives of the producers in producing complex mineral fertilizers should obviously be intensified by regulating prices.

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CHEMICAL INDUSTRY AND RELATED EQUIPMENT

BRIEFS

FERTILIZER PRODUCTION--The shift headed by foreman Siyavush Kuliyev has provided the first product in the new shop of the Sumgait Superphosphate Plant. Fertilizer output of the enterprise will comprise 1,200,000 tons annually with startup of it. This will make it possible to fully provide the fields of the Azerbaijan farmers and also the agricultural regions of the Transcaucasus, Northern Caucasus and Central Asia with superphosphate. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 Jun 79 p 1] 6521

AMMONIA PRODUCTION--The capacity of the Azot Association, at which an ammonia complex became operational yesterday ahead of schedule, was doubled. The new unit will produce 450,000 tons of product annually, which is sufficient to produce 2 million tons of fertilizers. Ten times fewer people were required to service the complex than at the old plant of the same capacity. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 5 Jun 79 p 1] 6521

AMMONIA CAPACITY--A highly productive ammonia production complex has been constructed by Severodonetskikhimstroy Trust at the Severodonetsk Association Azot from drawings of a branch of the State Scientific Research and Planning Institute of the Nitrogen Industry and Organic Synthesis Products. High unit capacity -- 1,360 tons of product daily -- made it possible to reduce specific capital investments by 10 percent. A progress energy production scheme has been implemented in which waste heat is utilized to the maximum and the unit is fully supplied with steam. The specific consumption of electric power is almost 10 times less than that in similar units. The economic effect from ahead of schedule introduction (by 10 months) and ahead of schedule development (by 8 months) of the complex comprised 72 million rubles. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 26, Jun 79 p 15] 6521

AMMOPHOS PRODUCTION--The ammophos complex at the Cherpovets Chemical Plant is one of the most important starting objects of this year for trusts of this association. And not only because this is a construction project of the fertilizer industry, but to an even lesser degree because this is a "long" construction project -- the builders disrupted introduction of the complex last year. But it seems unnoticeable that they have heard to return the debt: the task for 5 months has been fulfilled by only 84 percent. The new deadline for turnover, which was planned for the third quarter, is also not

far from being disrupted at the same rates. Despite the fact that more than 4,000 builders and installers (the figure far exceeds the planned figure) have been concentrated on the complex, the schedule for conducting operations is still being disrupted. Thus, the general contractor was supposed to turn over 14 large reinforced tanks of the phosphoric acid shop for lining by chemical production specialists as early as March. But half of the tanks have not been completed even today. Moreover, the technology of chemical protection work is such that no fewer than 3 months are required to complete it. This is plus the installation work. Briefly speaking, even a 2-week delay with turnover of the remaining tanks by specialists of Montazhkhimzashchita may push the startup deadline beyond the third quarter. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 13 Jun 79 p 3] 6521

TRIACETATE PRODUCTION FACILITY--Engel's--The second stage of the triacetate production facility at the Engel's Khimvolokno Production Association was put into operation. It was built by the personnel of the Engel'skhimstroy Trust No 3 and of Saratov organizations of the USSR Ministry of Installation and Special Construction Work. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 15 Jul 79 p 1] 11,439

TECHNICAL CARBON--Syzran'--A unit for the production of technical carbon--a valuable raw material for the rubber industry--was put into operation at the Syzran' Technical Carbon Plant. It was built by the personnel of Trust No 4 and its subcontractors. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 15 Jul 79 p 1] 11,439

MAIN AMMONIA PIPE--Gorlovka--The Gorlovka-Odessa main ammonia pipe is being technologically prepared for the transportation of liquid ammonia from the Stirol Production Association. The pipe extending from the association to the pumping station No 14 has already accepted the first hundreds tons of the product. According to the schedule, more than 3 months are assigned for the work on putting the first stage of the Gorlovka-Odessa main pipe into operation. A group of service engineers have taken measures that will help to shorten this period. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 15 Jul 79 p 1] 11,439

AMMIAK-11 UNIT--Berezniki--The commissioning of the Ammiak-11 unit at the Berezniki Nitrogen Fertilizer Plant scheduled for the fourth quarter of last year did not take place. A new date--August of this year--was set. However, the plant management transferred some equipment designed for the start-up complex to the existing production facility of its enterprise and it does not hasten to ensure delivery instead of it. As a result, the new date for commissioning this unit is also under the threat of not being met. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 15 Jul 79 p 1] 11,439

SIMPLE SUPERPHOSPHATE--Sungait--The capacities of the Sungait Khimprom Association should have increased by 360,000 tons of simple superphosphate during the first half year, but the commissioning of the new production facility was disrupted. The customer--Ministry of Chemical Industry--did not ensure the

prompt delivery of a large-size mixing chamber and instruments. The builders of the main contracting Trust No 1 of the Azerbaydzhan SSR Ministry of Industrial Construction also lag behind. /Text/ /Moscow STROITEL'NAYA GAZETA in Russian 15 Jul 79 p 1/ 11,439

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CONSTRUCTION, CONSTRUCTION MACHINERY, AND BUILDING MATERIALS

ETR-253A ROTARY BUCKET EXCAVATOR DESCRIBED

Moscow NA STROYKAKH ROSSII in Russian No 5, 1979 p 20

[Article: "ETR-253A Rotary Bucket Excavator of the Bryansk Highway Machine Plant imeni 50-Letiya Velikogo Oktyabrya"]

[Text] This machine is intended for use in digging trenches for main pipelines having a diameter of 1,420 or 1,220 mm, in thawed soils up to Group IV inclusive, and also in frozen soils having a freezing depth of up to 1.5 meters. During an hour's time and depending upon the type of soil involved, this excavator is capable of digging a trench 20 to 350 meters long, 2.5 meters deep and having a bottom width of 2.1 meters and a width at the top of 3.2 meters.



The rotor, the diameter of which is 4.5 meters (to the edges of the teeth), has 14 buckets arranged in a circle, with each bucket having a capacity of 250 liters. It is placed in operation by means of powerful electric motors, which in turn are powered by the diesel-generator of a DET-250M caterpillar tractor, upon which the excavator is mounted.

The excavator has an electro-mechanical transmission and a conveyer belt. It consists of two parts: a horizontal part located within the rotor and a mouldboard part restrained by two hydraulic cylinders. The conveyer belt, which is 1,200 mm wide, moves along at a speed of 4.9 meters per second.

The productivity of the excavator in 1st category soils is 1,200 cubic meters per hour. The average specific pressure on the soil -- 0.9 kilograms of

force per square centimeter. The forward transport speed is 3.5 and 5.4 kilometers per hour and reverse -- 3.4 and 5.2 kilometers per hour. The working speed is 20-350 meters per hour. The excavator has a convenient system of control which eases the work of the operator and also a comfortable cabin.

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CONSTRUCTION, CONSTRUCTION MACHINERY, AND BUILDING MATERIALS

EFFECTIVE METHODS FOR WORKING FROZEN SOILS

Moscow NA STROYKAKH ROSSII in Russian No 5, 1979 pp 32-34, 61

[Article by M. Artyemenko, senior engineer at TsNIITstroymash of the USSR Ministry of Construction and Road Machinery Manufacture: "Effective Methods for Working Frozen Soils"]

[Text] Permafrost soils and soils of seasonal freezing constitute up to 90 percent of the territory of the RSFSR. This derives from the duration of the winter period over a considerable portion of the republic which lasts 4, and in some oblasts, up to 9 months. During this period the soil freezes to a depth of from 1 to 2.5 meters. This is why the problems concerned with loose frozen soils are of special importance to the builders. The urgent nature of these problems is associated with the intensified development of the natural resources of Siberia and the Far East and with the overall increase in the volume of worked frozen soils.

How can this problem be solved? At the present time, the following principal trends are being followed: the creation of modern and more powerful construction machines, adapted for work in the northern regions; improvements in existing and the creation of new methods for loosening frozen soils; the use of a rational technology for utilizing machines; improvements in the planning and organization of earth work during the cold period of the year.

Several types of excavating machines are used for working frozen soil mechanically. Experience has shown that the greatest effectiveness is achieved when use is made of continuous action machines, with the soil being broken up and removed simultaneously with digging the trenches. This includes the ETR-253A, ETR-204, ETR-1325, ETTs-252 and other rotary and chain excavators, all of which are characterized by high operational productivity and reliability. Excavators having disk-cutting working organs have proven to be very effective. Taking into account the wishes expressed by the builders, the Dmitrov Excavator Plant, jointly with the Krasnoyarsk Branch of VNIITstroydormash [All-union Scientific Research Institute of Construction and Road Machinery], developed and this year is commencing the serial production of a new excavator of this type -- the ETR-134. This

completely hydraulic machine with its disk-cutting working organ is mounted upon a TT-4 tractor (see Figure 1) and it is intended for use in the digging of rectangular trenches up to 1.3 meters deep and 0.27 meters wide, for the laying of cable and flexible pipelines and also for making cuttings in frozen soils with subsequent extraction of pillars using other means.



Figure 1. ETR-134 rotary trench excavator with a disk-cutting working organ.

Many construction organizations are creating their own machines for the working of frozen soils. The Karacharovskiy Mechanical Plant of the Order of Lenin Glavmosstroy [Main Administration for Housing and Civil Engineering Construction in Moscow City] is producing the ZFM-23UOM excavating-cutting, which was developed by the Special Design Office of Mosstroy [Moscow State Construction and Installation Trust] jointly with trusts 1, 2 and 5 of Mosstroymekhanizatsiya [Moscow Trust for Mechanized Construction] and which is intended for use in the working of frozen soil by layers during the construction of roads, for carrying out different types of leveling work during the winter period and also for the breaking up of asphalt concrete surfaces (see Figure 2). The departments of this plant are also producing the high speed and modernized BTM-3M trench machine. Trust No. 2 of Mosstroymekhanizatsiya developed and produced a double-disk cutting machine for use with the D-687 bulldozer (see Figure 3). This machine will be used for cutting longitudinal and transverse openings in frozen soil 0.1 meters wide and up to 1.2 meters deep and with each such opening being worked at a later time by excavators. The productivity of this machine is 290 meters per shift. Glavleningradstroy [Main Administration for the Housing, Civil Engineering and Industrial Construction of the Leningrad Gorispolkom] is producing the M-840 disk-cutting machine for use with the D-494 bulldozer.

The block method for working frozen soils is being employed extensively. Moreover, in addition to rotary excavators and disk-cutting machines, extensive use is being made of bar machines in connection with this method. A bar of the chain type with cutters is being used as the cutting organ in these machines. The drive for the cutting bar is carried out through a reduction gear from the power take-off (for the BGM-3, DPG-ZUM and other



Figure 2. ZFM-2300M excavating-cutting machine

bar soil-cutting machines). The working organ is raised and lowered by means of a hydraulic cylinder. Considerable interest is being displayed in a bar soil-cutting machine that is used in conjunction with the D-271 bulldozer; it has an offset working organ that makes it possible to install trenches along the edges of roads and also to carry out work under crowded city conditions. During the course of 1 hour, it is capable of digging a trench 20 meters long, 1.4 meters deep and 0.3 meters wide. The machine is produced by Mosstroymekhanizatsiya Trust No. 1 of Glavmosstroy.



Figure 3. Double-disk cutting machine for use with the D-687 bulldozer

One of the best mechanical methods (particularly for the digging of large ditches) consists of working the soils using bulldozer-rippers mounted on tractors having engines with power ratings of 160, 300 or more horsepower. The Chelyabinsk Plant for Highway Machines imeni Kolyushchenko is serially producing DZ-94S, DZ-116KhL and other bulldozer rippers. The DZ-94S bulldozer ripper (see Figure 4), which is still the most powerful of its type, was created for use with a T-330 tractor having a 330 horsepower engine. It has DZ-59KhL bulldozer equipment with a non-rotating mouldboard and DP10S ripping equipment with one or three teeth. The machine is intended to be used for the working and moving of thawed and frozen soils and light (fractured) rock. When three teeth are employed, the loosening width for the frozen soil is 2 meters and the depth -- 0.7 meters. The greatest speed of movement is 16.4 kilometers per hour. The working organs are raised (or lowered) by means of hydraulic cylinders.

Recently, greater use has been made of machines and equipment of static action for the working of frozen soils. Thus the Kovrov Excavator Plant, in accordance with a plan developed by VNIIstroydormash [All-Union Scientific Research Institute of Construction and Road Machinery], has commenced the production of SP-62 dual-action hydraulic hammers having an impact energy of 900 kilograms of force per meter, for use with EO-4121 hydraulic excavators. In accordance with a plan developed by SKB-Mosstroy, Mosstroymekhanizatsiya Trust No. 4 of the Order of Lenin Glavmosstroy is producing single-tooth rippers for mounting upon EO-4121 hydraulic excavators. This ripper appears as a -shaped frame on which the principal and additional profiling faces of the tooth are located. The frame is installed coaxially with a bucket. The crane hydraulic cylinders of the excavator are used to drive the ripper. The stresses on the teeth of the loosener are directed counter to the stresses on the teeth of the bucket and this serves to relieve the excavator almost completely of considerable loads applied to the teeth. This ensures reliable and faultless work by the excavator and the merging of a number of technological operations -- high productivity.

It is readily apparent that a broad range of excavating equipment is available for the mechanical working of frozen soils. However, a shortage in the number of machines available requires that the builders employ a well thought out and rational technology with regard to the utilization of these machines. Their use for residential housing construction in Moscow can be recommended in the form of positive experience. A technological chart was prepared here for the use of the machines and also the explosive method. The machines were scheduled for the various types of work depending upon the freezing depth of the soil and the condition of the site.

In accordance with this technology, the loosening of soil during the construction of a road bed, for any freezing depth, should ideally be carried out using a ZFM-13/10M excavating-cutting machine. During one pass, it loosens a strip 2.3 meters wide and 0.35 meters deep and with a cutting speed of 0.7 or 1.0 meters per second. The productivity of the machine is 150 cubic meters per hour.

The preparation of foundations for houses, stores and so forth, is carried out using hydraulic excavators with special equipment (hydraulic hammer, ripping tow hooks and so forth), rippers on 250 horsepower tractors (RMC-1, -2, -3 and also DP-95-1 and others), disk-cutting ETR-132, ETR-134, ETR-161 excavators and others. If the freezing is greater than 1 meter, use is made only of excavators or explosions -- open or with localizers.

When installing a heating network, sewerage system or run-offs to a depth of up to 1.8 meters, gas lines and water lines, for any freezing depth, use can be made of hydraulic excavators with special equipment, the ER-7A rotary excavator (if available, ETR-204, ETR-223 and others) and also explosions -- open or under localizers. If the freezing depth is less than 1 meter, use can also be made of disk-cutting excavators.

On sectors of high voltage cable routes, when laying up to two filaments and in the presence of clean soil, use can be made of the BTM-TMG excavator, which has a digging width of 0.5 meters and a depth of 1.5 meters. If a cable run is laid out in clean soil using up to six filaments, then the work requires the use of an ER-7A rotary excavator having a digging width of 1.2 meters and a depth of 2.2 meters, a hydraulic excavator with special equipment and an explosion with localizer. If the soil contains construction debris, use is made of hydraulic excavators, the explosion method and electrical or fire warming.

The schedules for the various types of work, the mechanization equipment for carrying out this work and the methods to be employed for working the frozen soils are included on the technological chart. In the process, a determination is made as to which machines were most effective in carrying out the various types of work. In conformity with this chart and the schedule for building the projects, a schedule is composed for the use of the machines. For example, during the construction of a childrens' hospital complex at Tushino, the use of such a graph made it possible to increase the coefficient of use for the machines in working the frozen soil, to decrease their idle time and to accelerate the earth work.

The mechanical method is being used for working roughly 65 percent of the frozen soils and the remaining portion -- by the explosion method (approximately 25.5 percent), by protecting against freezing conditions, by thawing out and by chemical defrosting.

During the past few years, more extensive use has been made of the explosion method for loosening frozen soil; this method is rather effective and economically justified in many instances. Explosives are being used in construction work mainly for loosening the soil prior to its being removed mechanically using the drilling-blasting and slit-explosion methods. Of these two methods, the former is being used most extensively. For drilling bore holes and blast holes, use is being made of the serially produced machines BM-202, BM-251, BM-303, BTS-150 and others and also BGM-2 and BEGM-1, developed by SKB-Mosstroy.



Figure 4. DZ-94S bulldozer-ripper for use with the T-330 tractor

Industrial tests were recently completed on new and safe means for carrying out blasting work under municipal construction conditions and in the direct vicinity of industrial buildings, apartments, underground communications and LEP [electric power transmission lines]. USSR Gostekhnadzor has authorized the use of the VVM-4 high voltage explosive device for setting off low-sensitivity EDV electric detonators under a moving metal cover -- localizer. It was on this basis that Glavnovosibirskstroy developed and created a drilling-blasting unit for use with the T-150 tractor. This unit includes a machine for drilling bore holes and blast holes, with the installation of it of the VVM-4 high voltage explosive device and a mobile explosion localizer. The use of this unit made it possible to raise the labor productivity of a team of demolition specialists by 1.6 times and to reduce the labor expenditures involved in relocating the machines and equipment. A similar complex is available for use within Glavmosstroy.

A new technology has been developed for carrying out the loosening work using the slit-explosion method. The destroyed tract is broken up in advance into individual blocks by means of vertical slits cut parallel to one another by means of bar soil-cutting, dual-disk cutting or disk-cutting machines. The charges in the slits are actuated by one continuous thread of a detonating fuse. This method serves to raise labor productivity, since each charge does not have to be connected up separately to the explosive circuit and the specific expenditure of explosives is reduced up to 30 percent.

Work is being carried out at the present time in connection with the mechanization and automation of operations concerned with the loosening of frozen soils using the slit-explosion method. The VNIIzemstroy has created a complex of slit-explosion (KM-401) and slit-charge (KM-404) machines for use in installing land reclamation canals up to 3 meters in depth using explosives; the complex has a productivity of up to 50 cubic meters per shift. This new technology for explosion operations can also be employed for other types of construction.

In implementing improvements in the existing methods for loosening frozen soils, the scientists attached to the Institute of Mining Affairs of the Siberian Branch of the USSR Academy of Sciences proposed a method for the flameless firing of "hydrox" cartridges, the principle of which is based upon a chemical reaction of a powder-forming compound in the cartridges, as a result of which a considerable quantity of gas forms under a pressure of 1600-1800 kilograms of force per square centimeter. The charges are explosion-proof. A VS-1 generator for controlled explosions has been created at the TsvIIIpodzemstroy; it operates on the basis of liquid explosive mixtures formed from an oxidant and a fuel (non-explosion proof separately). By assigning the volumetric expenditure of the components and the injection frequency for the catalyzer, it is possible to control the pulsating explosion process within a broad range in terms of both the power of the explosions and the frequency of their alternation one after the other.

The thawing out method and chemical defrosting are employed when carrying out small volumes of work in crowded areas and also when there is a shortage

in the equipment required for working frozen soils. The existing methods for thawing out frozen soils -- fire, steam, water, electrical, hot sand and others -- are not being employed extensively, since their cost exceeds the cost for mechanical methods by three times and the cost for loosening with the aid of explosives by two times.

The chemical defrosting of frozen soils of various types using salts and alkalis in a complex with electrical heating and mechanical effects appears to hold more promise for the future. A technology has already been developed for this method and the availability of new salts (particularly aptat) created by the Institute of Inorganic Chemistry of the USSR Academy of Sciences is providing even greater opportunities for its use.

One effective method for preparing soils for working during the winter period is that of protecting the surface layer against freezing conditions. This can extend by up to 2 months the duration of use of excavating machines during the autumn period and it will make it possible to commence work 1 month earlier at the end of winter or in the spring. There are many methods available for protecting soils against freezing, from traditional ones (loosening the upper layer with plows or rippers, snow retention, covering with slag or sawdust and so forth) to modern ones -- chemical processing, covering with polymer foams and so forth. Units have been created for obtaining polymer foam and a technology has been developed for the thermal insulation of soil. A method for applying a layer of foam to a soil's surface, developed at Glavdal'stroy [Main Administration for the Construction of Industrial Establishments in the Regions of the Far East], is deserving of attention.

In conformity with the plan for carrying out earth work, those sectors where a requirement exists for warming the soil are being singled out. The delivery of the foam plastic components to the place where the work is to be carried out and the preparation and applying it to the soil's surface are carried out with the aid of a mobile MUZP-3 unit mounted on a PM-130 watering-washing machine. In addition, a tank with a capacity for 210 liters of acid and a portable foam generator are installed on this machine. The topping off of the mobile unit with muriatic acid and the preparation of the component structure of foam plastic from urea-formaldehyde resin a foam agent and water are carried out at a fixed station. The rapid hardening foam plastic is prepared directly at the place where the work is to be carried out and it is applied to the surface of the heated soil in a layer up to 200-300 mm thick. The introduction of the acid makes it possible to obtain a stable foam plastic composition with minimal shrinkage. One minute following application the foam plastic begins to harden and to adhere firmly to the soil's surface. The hardened layer of foam plastic reliably protects the soil against freezing. The productivity of the foam generator is 150-180 cubic meters per hour.

Naturally, the methods discussed in this article for working frozen soils do not cover the entire problem. We have examined only the new developments

that are presently being employed for solving it. However the problem of loosening frozen soils today continues to be one of the most important national economic tasks associated with the rapid development of the natural wealth available in the Far North, Siberia and the Far East. Many questions still remain and thus the creative initiative and research activities of the builders, machine operators, scientists and creators of construction equipment must be directed towards obtaining solutions for them.

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CONSTRUCTION, CONSTRUCTION MACHINERY, AND BUILDING MATERIALS

SOME PRINCIPLES OF ACCOUNTING FOR CONSTRUCTION OUTPUT DEBATED

Moscow VESTNIK STATISTIKI in Russian No 7, Jul 79 pp 49-53

[Article by M. D'yachkov Moscow: "Some Questions of Construction Output Statistics"]

[Text] The scale of construction and the peculiarities of this area of material production impart special significance to questions of planning and economic reporting for construction. This is all the more important because the system of construction-industry enterprises has its own specifics and is distinguished by great dynamism.

Construction is not conducted under fixed conditions. Construction organization activity is characterized by discontinuity of operations. The stationing of operating subdivisions (construction administrations, offices and sections) change constantly because of changes in the geography of construction that arise from year to year in territorial schemes for siting enterprises and facilities that are to be introduced. Shifts in the capital investment structure of this branch and in the nature of the reproduction of fixed capital are of no little importance here.

Our construction industry now numbers about 30,000 self-sufficient enterprises that are specialized by branch of the national economy and by numerous, diverse types of construction work. They are doing the overwhelming (up to 90 percent) proportion of all construction work. In 1977 construction industry enterprises did 70 billion rubles' worth of work.

Enormous resources—labor and material—have been concentrated in this field. It is manned by more than 11 million workers. Working capital has been set in the sum of 63 billion rubles, fixed capital at 43 billion.

The construction industry's program and its production volume are formulated in close connection with the capital investment plan. As is known, capital investment is growing continuously in volume and its structure can be changed as a function of many causes. The share of construction work in the amount of capital investment fluctuates considerably as changes occur in its direction or purpose. Let us note that the production volume of construction enterprises consists in work called for by the state

capital investment plan and also work on construction repair, which is specially planned and reported. Moreover, housing-cooperative and individual construction, as well as construction for social organizations, kolkhozes and consumer-cooperative enterprises must be added. They likewise are not included in the state capital investment plan.

Thus, the construction industry program is made up of two separate parts. One reflects the work done under the state capital investment plan, the other reflects work that is outside its scope. Of course, the overwhelming portion of the work comes under the state plan. It consists of work that is more complicated and more important and significant with respect to both economics and the technology of the operations themselves.

The main indicator of construction output that is applied in planning construction volume is *cost*, which is expressed in budget-estimated prices. Its output also is accounted for in these same estimated prices. This is how the generalized data that characterizes the volume, dynamics and structure of construction operations within the various regions and departmental systems and the whole country are formulated.

It must be borne in mind here that this indicator reflects a pooled amount, since data about finished output and that part of it that is still being worked on are poured together in it (similar to the gross output indicator in industry). This, of course, is a common feature of the gross output index in both industry and construction. But in construction accounting there are extremely important differences. These consist of the fact that gross construction output is accounted for in an ambiguous calculation that includes double counting and excludes it. Where construction output accounting does not include double counting, work performed by in-house forces is segregated from total work volume. The existence of this indicator in turn enables that portion of construction work that is performed by third entities in construction operations--the subcontractors--to be broken down. Let us note that at present they do up to 60 percent of all contracting construction work.

The breakdown of work that is done by in-house forces in total work volume serves completely defined purposes--the systematic accounting for construction work, and the application of an integrated indicator of the amount of construction work actually done, beginning with the indicators of the activity of the construction administration or trust taken separately and ending with the ministry as a whole.

The latter in this case is not restricted to the volume of production and its dynamics and structure. It is no less important to emphasize also that qualitative construction-work indices--labor productivity, construction operating costs, specific material and labor expenditures, profitability, yield on capital, and other indicators, are also determined on the basis of this data. And construction industry statistics are distinguished by this factor from industrial statistics, where the enumerated indicators are computed according to gross output data, which is determined without correcting for double counting.

The economic reform that is being conducted in construction in accordance with CPSU Central Committee and USSR Council of Ministers Decree of 28 May 1969 brought radical changes into the system of settlements between contractor and client, calling for a transition from settlements for constructional elements to settlements for completed facilities as a whole without intermediate payments, or, in more complicated cases, for consolidated work stages.

Because of the intensification of construction work, the duration of the construction cycle has been sharply reduced, and settlements by facility have been applied quickly in work practice, especially in the area of housing and public-building construction.

In more complicated construction, facilities are broken down into several stages. Each of them combines a whole complex of various constructional elements. In housing construction the whole facility can be subdivided into no more than two or three stages--although the constructional elements therein can add up to many times that many stages.

In order to provide for a uniform approach to the identification of stages as consolidated units of measurement of construction output in making contractor-client settlements, a cost criterion--the lowest level of budget-estimated cost of a work stage for which a consolidated settlement should be made--is established for them. This level is differentiated by the various types of construction.

Introduction of the new system of settlements in construction is apparent from the following data:

Distribution of Construction Volume by Type of Settlement

Settlements	(in percents)		
	1970	1976	1978
For finished facilities that have been built.....	5.0	42.0	60.0
For finished work stages.....	31.0	54.0	36.0
By constructional elements and by percent of completion.....	64.0	4.0	4.0
Totals.....	100.0	100.0	100.0

Conversion to settlements for whole facilities poses new tasks for accounting by construction organizations and for construction output statistics. It becomes necessary to organize current reporting and statistical monitoring over construction-output volume in accordance with the data on the completed construction of facilities. In our view, this construction output can be counted as finished output. The general criterion for finished construction output is the capability to perform those functions that were stipulated for its erection, in accordance with approved technical documentation. Thus, for an industrial facility this is the capability to

support the production process, for a storage building--to provide normal conditions for the storage of freight for various purposes, and so on.

But the matter of facilities--this is not the limit of the consolidation of settlements. The above-mentioned decree also had in view another form of consolidated settlements, when the client accepts the work after the enterprise as a whole is introduced into operation. Accordingly, the financial resources necessary for the work appear in the form of bank credit in the amount of the cost of the enterprise being erected.

Experiments are being conducted in this area. Settlements with the client are confined to completion of the complex of all operations embraced by the design, as a consequence of which the role of the budget estimate itself is basically changed. A saving from the budget estimate (the difference between the budget-estimated cost and the actual construction operating costs) remains at the disposal of the contracting organization. On the other hand, an overrun of actual outlays for construction work above the budget-estimated cost for the work leads to negative financial results for the contracting organization.

Let us recall that the existing standard system for reporting construction-industry indicators is subdivided into two parts: 1) indicators of the amount of work, which are given in generalized form by branch of construction and by separate category of clients, in terms of cost (budget-estimated costs); and 2) indicators of introduction into operation, which, unlike work volume, are given in terms of the facilities being built--by capacity, area, cubic volume and so on. A monetary and cost assessment of the fixed capital that is put into operation is not called for, either in the accounting or the reporting of contracting organizations. A correlation of the indices that characterize construction production and its final results is made difficult by this.

This is not the case for settlements for realization of the design as a whole. Conditions are created for organizing systematic monitoring over fulfillment of the plan for introducing facilities and items of capacity into operation, both in terms of what is being built and in terms of cost--in the budget-estimated assessment in a comparison with their capacity. But the budget-estimated cost of the facilities that are introduced into operation is made up not only of work performed by in-house forces. Also counted are subcontracting operations. Where there is major technological specialization in the construction industry, a synthesis and a generalization of the data of the general contractor and of his numerous subcontractors becomes necessary--without which a complete notion about the budget-estimated cost of each facility cannot be obtained.

Thus, under the new conditions, data is being organized in two areas. One calls for the monitoring of construction work, the other--the introduction of fixed capital into operation. These two streams are interdependent.

However, a reservation is necessary here. The conversion of contracting organizations to accounting for the finished construction product does not

eliminate the need to account for the capital investment and fixed capital that are being put into operation, which the developers themselves do directly. This is accomplished in accordance with the state capital investment plan, which is made up from the viewpoint of the customers for the fixed capital and the items of capacity that are being put into operation and of those ministries and agencies and those branches of the national economy for which this capital is intended. Using only this source of information, it is possible to monitor fulfillment of the state plan for introducing fixed capital and capacity into operation, the plan for capital investment and the dynamics, structure and purpose thereof, the routing and distribution of capital investment in terms of territorial area, and, finally, disclosure of the amount and structure of uncompleted capital construction.

A change in the procedure for financial settlements in construction leads to a change in the formulation of the documentation that is necessary for accounting and statistics, both of contract activity and the activity of developers in capital-investment accounting and statistics. In connection with the consolidation of settlements, the amount of uncompleted construction (construction in progress) that is related to the contract activity of construction organizations is growing sharply in the reporting data of these organizations and on their books. These indicators are rising continuously. During 1970-1977 the amount of contracting work increased by 40 percent. At the same time, the amount of uncompleted construction in progress rose. At the end of 1977 the total amount of uncompleted construction at state and cooperative enterprises and organizations (not including kolkhozes) amounted to 92.5 billion rubles. Such a situation is explained as follows. In the first place, a certain portion of construction work (10-12 percent) is still being done by developers themselves, by the so-called owner method. Second, consolidated settlements in their complete form (by facility) still cover little more than half of contracting work. Third, the developers' uncompleted capital investment includes not only construction work but also other types of capital investment, among which equipment in the process of installation is singled out especially. It exceeds 40 percent of total capital investment in production-type construction.

Previously, the primary (financial-settlements) documents that were drawn up regularly and the month-to-month acceptance of work served as the source of information for capital investment statistics (the developer's statistics). The consolidation of settlements changes the situation radically. There is a gap between the flow of financial-settlements documents and that data that is especially necessary for construction-industry accounting and reporting. A new function for contractors arises here. They are charged with day-to-day assembly and with presentation to clients of monthly information about the total amount of work done by them and by their subcontractors, by uncompleted stage (where settlements are made for stages) and by facility (where settlements are made for facilities). This information, which is compiled in an up-to-date manner by general contractors, also includes data that are related to orders carried out by subcontractors that have not been completed or turned over to the customers. On the other hand, the output received from the specialized organization is dumped onto the

general contractor as uncompleted construction that is in progress until this subcontract work results in the full completion of construction of the given facility. As a result, that work that is included in finished output in the reporting of specialized organizations turns up as a component part of work in progress in the general contractor's reporting.

It stands to reason that such reporting cannot be considered as systems reporting, so its data are not reflected in the capital-investment inventory. But the data are cited in the model statistical reporting as capital investment. They combine the indices of the current reporting of the contracting organization and the current reporting of the developer himself. It also happens that the capital investment inventory reflects one sum, and the form No 2-ks another, much larger sum. All this requires special attention. A check of the whole cycle of these reporting operations and of the validity and completeness of the reporting indices that are organized on the basis of them is one of the important questions of improving accounting for capital construction. Simultaneous censuses of incomplete construction could be of use here with a view to disclosing hidden reserves and an unsubstantiated level of incompletely completed work and to preventing losses.

Let us note that the plan for introducing fixed capital and capacity into operation, like the capital investment plan, is designed by branch of the national economy, by separate departmental system, and by area of the country. Data about the amounts and the structure of uncompleted construction are necessary for compiling this plan. They constitute baseline information for calculating the planned construction investment volume, the resources required for it, and the amounts of backlog of construction starts for the ensuing plan period.

The changes brought into the output statistics methodology meet modern requirements for the construction activity and are finding increasingly wide use in practice. In this case, as with every new matter, it is possible that approaches to the solution of problems that arise and to improving the organization and methodology of construction reporting are not uniform.

In this connection I would like to dwell on one publication.* It pays main attention to the reporting of output in organizations that are specialized in the performance of various types of work. Such organizations usually carry out orders in the subcontract procedure, that is, on the basis of technological specialization. The work of each is performed at the construction project in cooperation with other organizations that are taking part in executing the adopted design. Having the specialized organizations in mind, the author writes that, unlike them, the question for general contractors about reporting "...commodity construction output has been solved unambiguously...." And following this we read: "completed buildings and structures cannot always be considered as final construction output" (p. 64).

*See *STATISTIK STATISTIK* [The Statistics Herald], No 11, 1978, pages 63-67.

In our view, the general contractor's opposition to the subcontractors on the principle of formulating indicators of their output is nonuniform. The chief peculiarity here is that the formulation of indicators of finished or tentatively finished output has a definite connection with the financial settlement system that is adopted, which is called upon to serve the purpose of strengthening economic accountability principles within the construction industry. Because of this, it is necessary to dwell on those tasks that arise in the methodology of the industry's accounting and statistics under modern conditions of technical progress and intensification of construction production. A precise determination of the construction industry's functions in the overall process of reproduction of fixed capital is of special importance here.

From this point of view one cannot identify construction's final output as a branch of material production with fixed capital that is introduced into operation. And it is not just the fact that a huge component part of fixed capital is comprised of industrial and power-engineering equipment that does not take part in making up construction output indicators, in either domestic or world practice in the reporting and statistics for this branch of material production. The operations themselves of installing equipment are becoming each year increasingly a matter of the finishing function of the industrial production of the plants themselves--the suppliers of the equipment. The output of construction operations (particularly the installation of equipment) is thereby being transformed into the product of another sector--industry.

Still another procedure for reporting finished subcontractor output is proposed. The essence of the proposal is to establish the amount of finished construction output of subcontracting organizations in statistical reporting to correspond to the introduction into operation of production capacity and facilities that have been built, that is, to the completion of all work in accordance with the general contracting agreement. This basic thought of the article is left unexpressed. Nor did the author touch upon the question of the procedure for current reporting of all work carried out completely and on time by the subcontractor within the period prior to introduction into operation of an enterprise or a complex that is due for startup. He also bypasses the question of subcontractors' settlements with general contractors when the time between the completion of subcontracting work and the introduction of finished facilities into operation can be measured in years. But the main thing is the fact that the suggested procedure for determining the finished output of specialized organizations is in complete contradiction to the economic accountability principles of their work.

It is impossible to use such a scheme in industry, even at enterprises of such branches of it as shipbuilding and heavy machine-building, where the technology of production also is based upon the output of individual items or of small series and is organized on the basis of wide production ties with other allied enterprises, who are, in effect, subcontractors, who fabricate finished components, parts and semifinished items for the head enterprises. Moreover, here, as in construction, production is usually

performed on order, but the length of the production cycle is much less than in construction. But still, such ideas of transformation of the reporting of the final output are alien to industrial enterprises.

In completing his observations, the author leaves no doubt that he has in mind the enterprise and not its separate (production) subdivisions. He considers that economic accountability can be strengthened, "...on the basis of the prevalence of unity of common purpose in preserving accounting by each construction enterprise for its own volume of commodity output" (p 67). However, the author does not explain what this means.

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CONSTRUCTION, CONSTRUCTION MACHINERY, AND BUILDING MATERIALS

CONSTRUCTION AND ROAD-BUILDING MACHINERY

Moscow EKONOMICHESKAYA GAZETA in Russian No 27, Jul 79 pp 1,2

Text7 Industry enterprises provide equipment to the housing, road-building and reclamation construction efforts, to the lumber and peat industry, construction materials industry, and to municipal services. Enterprises of Minstroydormash production associations and plants produce various machinery--approximately 2,000 items in all.

During the first three years of the Tenth Five-Year Plan, workers from this sector produced 106,400 excavators, 146,600 bulldozers, 32,700 scrapers, 49,800 self-propelled and 10,000 tower cranes, 16,600 loaders, 49,000 elevators, and many other products.

As shown in the diagram published here, this year calls for a 22 percent increase in production volume as compared to 1975. With 1975 production level equal to 100 percent, the growth in Minstroydormash enterprise production volume was 107, 112, and 115 percent for the years 1976, 1977, and 1978 respectively, and is projected by plan for 1979 at 122 percent. Envisaged is a growth at outstripping rates of the output of the most advanced machinery and equipment--single bucket fully rotational excavators, truck-mounted cranes with hydraulic drive. An important task is to increase delivery compared to last year of trenching-rotary excavators for reclamation operations, and of new high-capacity skidding and stacking machines for lumber workers. Plans call for a substantial expansion of product range and to increase output of mechanized construction-installation tools and finishing machines.

During the 1976-1978 period, enterprises of the Ministry of Construction, Road-Building, and Municipal Services Machine-building have developed the manufacture of a series of highly-efficient machinery, to include increased unit power with the wide utilization of hydraulics and automation. For example, the production of hydraulic excavators with bucket capacity from 0.25

to 2.5 cubic meters has been implemented on a series (batch) production basis. Their productivity is 30 to 50 percent higher, and unit metal content 20-30 percent less than comparable machines with mechanical drive.

During those same years, series production began for the newest equipment and machines for rapid construction of main highways. Such equipment, with the use of assembly-line methods, enables the entire complex of earth-moving, concrete, finishing, and other operations to be completed, and to lay more than a kilometer of first-class highway in a single shift. Each set of these machines employed saves the labor of 400 workers. Industrial lines are now being produced for the construction materials industry for manufacturing cement using the dry method which are rated at 3,000 tons per day. The cost of the cement is reduced by 7-10 percent.

In collaboration with Polish machine builders, combined production of derrick-arm cranes, self-propelled, 40 ton capacity, which are mounted on truck-type high-speed chassis has been developed. Prototypes have been built of truck-mounted cranes with capacities ranging from 25 to 63 tons, and a 100-ton crane is also being built.

Technological progress is characterized also by improved designs, expanded output of self-propelled scrapers, cement-mixing units, machinery for reclamation operations, lumbering and flotage, mechanized construction tools, and equipment for municipal services. During the 1976-1978 timeframe, 252 new machines were built and delivered for series production, and at the same time, production was concluded for 231 obsolete machines.

Virtually the entire growth in production volume was attained by increased labor productivity. Its level has risen 14 percent over three years.

Retooling of industry enterprises is underway on a large scale this year. Overall, 154 shops and sections are to be fully automated, 100 line-mechanized and automated production lines are to be built, 69 mechanized warehouses are to be constructed, and approximately 1,000 automated and special equipment units are to be placed in operation. This will save the labor of more than 6,600 workers.

Growth of labor productivity in Mistroydormash enterprises: 1975 level is equal to 100 percent. Levels equalled 104, 110, and 114 percent for the years 1976, 1977, and 1978 respectively, and the plan level for 1979 is 119 percent.

Large scale socialist competition to improve efficiency and quality of work is being consolidated in enterprises of the construction,

road-building and municipal services machinebuilding. During the first five months of 1979, production volume increased by 5 percent over the same period for the preceding year. Productivity of labor grew by four percent. Supplementary production for the January-May assignment totaled several tens of millions of rubles, including scrapers, tower cranes, and approximately 1,500 tons of equipment for cement enterprises and reinforced-concrete design plans.

The industry has major reserves at its disposal for better operations. An example of how to utilize these reserves is demonstrated by the collectives of outstanding enterprises. One of these is the Mogilev "Strommashina" Plant. Here during the first three years of the five-year plan, production volume grew by 28 percent as opposed to 23 percent called for as a goal. The level of labor productivity increased by 24 percent, higher than envisioned by plan. Ten types of primary items bear the State Mark of Quality.

The Mogilev machine builders, as the result of precision in intra-plant planning and the efficiency of control, produces its items in a rhythmic manner. The know-how of the Mogilev "Dinamo" Plant in the development of individual annual and five-year plans to increase labor productivity is widely employed.

Growth in the production of items bearing the State Mark of Quality (in terms of percent of overall production volume) for the years 1976--11 percent; 1977--16 percent, 1978--19 percent, and (plan) 1979--24 percent.

A majority of piece workers operate according to plans of the type developed at "Dinamo". Production processes are systematically mechanized and automated, and new technology, specialized equipment, and machines are being introduced. This year, the plant, a winner last year in the All-Union Socialist Competition and awarded the traveling Red Banner of the CPSU Central Committee, the USSR Council of Ministers, the AUCCTU and the Komsomol CC, continues to develop the results it has attained.

The collectives, with the plant, have improved their positions in the campaign to improve efficiency and quality; those collectives' enterprises were also awarded in the All-Union Competition; the Ivanovo Production Association, "Avtokran", the Odessa Plant, "Stroygidravlika", the Sverdlovsk Association, "Pnevmostroymashina", the Berdyansk Road Machinery Plant, and the Kalinin Excavator Plant.

Unrealized Opportunities

There are many serious shortcomings observable in the economic operations of all-union industrial associations and enterprises; those shortcomings continue to occur. The Ministry is not now

fulfilling assignments established by the five-year plan for the production of excavators, loaders, cranes, and elevators. That unused reserves exist is witnessed by the fact that 16 enterprises of the total of 157 production associations and plants did not satisfy the January-May plan for production sales. The Kostroma Excavator Plant, the Andizhan Irrigation Machine Plant, the Georgiyevsk "Stroyinstrument" Plant, the Valmiyera Fire-fighting Equipment Plant, and the Alapayevsk Road Machinery Plant are all operating below their capabilities. Twenty-seven enterprises permitted labor productivity growth to lag.

If all production associations and plants were to operate as well as the outstanding enterprises, industry indicators would be considerably higher. This is why advanced know-how must be systematically disseminated regarding the acceleration of labor productivity, improvement of product quality, and the conservation of materials, fuels, and electrical power. This is the first-priority obligation of the Minstroydormash and its 12 all-union production associations.

Strengthening plan discipline is required, as is the responsibility of economic managers in all management elements for the fulfillment of order and contractual assignments. For example, the All-Union Production Association, "Strommashina" during the period January-May was 178 crushers short in deliveries to its customers. A significant amount of those are owed by the Kemerovo Plant, "Strommashina" and the Vyksa Crusher-Grinder Equipment Plant. Both these enterprises, having fulfilled the plan for total production volume, disrupted the plan for the primary or basic range of products manufactured.

Production cooperation has been developed within the industry. Component parts are precisely manufactured and shipped to such cooperative-associate plants as the Moscow Machinebuilding Plant imeni Kalinin and the Kiev "Krasnyy Ekskavator" Plant, as are castings. There are, however, enterprises disrupting the schedule for cooperative deliveries, including specifically, the Andizhan Machinebuilding Plant.

Technological Progress Tasks

One of the chief areas of technological progress in this industry during the Tenth Five-Year Plan is the establishment and development of production for machinery systems for the comprehensive mechanization of operations in the industrial, agricultural, reclamation, housing, and road construction sectors. This year, an equipment complex for the first highly-mechanized reinforced concrete structure (industrial type) plant must be manufactured. Its annual capacity will be 200,000 cubic meters of finished product. This enterprise is earmarked for construction in the city of Ivanovo.

A number of enterprises is participating in the fulfillment of orders for equipment for the new model highly-mechanized (large) panel building construction plant. It will provide reinforced concrete items for the construction of buildings totalling up to 180,000 square meters annually. At this plant, as the result of technological progress, specific labor expenditures in the production of reinforced concrete items are being reduced by 25 percent.

An important task is the expansion this year of construction equipment output for equipment for northern use. Specifically, for excavators, bulldozers, and cranes designed for northern and north-eastern regions, output must be increased by a factor of 1.8 when compared to the previous year (1978).

All-Union Production Associations, scientific-research and plan-designing organizations and plants unfortunately are not applying sufficient efforts to reduce periods required for the development and implementation of new equipment manufacture. The greatest amount of equipment now under production for 10 or more years, i.e. obsolete equipment, is produced by "Soyuzdormash" and "Soyuzstrommashina". At the Skopin "Stroymashavtomatizatsiya", transition to the manufacture of modernized equipment for transporting plaster mixtures has been delayed for some time, the new equipment would replace obsolete models certified for category 2 quality.

Updating or modernizing products in a number of cases has been delayed because of associate-suppliers, e.g. of base machines or vehicles, tractors, prime-movers, trucks, and engines. Major construction sites are in need of earthmoving-transporter equipment with improved unit power. The Ministry of Tractor and Agricultural Machinebuilding has been tasked with the rapid organization of heavy caterpillar tractor manufacture, and the Ministry of the Automobile Industry for producing powerful single-axle and double-axle prime-movers.

Machinery Quality--An Unremitting Concern

In a majority of Minstroydormash associations and plants, systematic work is underway to improve the quality of products. Here the know-how of L'vov enterprises, supported by the CPSU CC, is used to implement a comprehensive quality control system. This is facilitated by the use of more advanced standards. During the first three years of the five-year plan, 99 new State Standards (GOST) have been developed.

Following the example of the Muscovites slogan, "A Working Guarantee For A Five-year Plan of Quality" has undergone broad expansion. Currently, production workers are participating--four times the number at the beginning of the five-year plan.

Almost two-thirds of the workers employed in basic production are involved in the no-defect system for manufacturing parts, assemblies, and ready products, and the delivery of these items on first request.

The highest technological level for production was attained by collectives of the following production associations--the Rostov "Sickiroinstrument", Sverdlovsk "Pnevmostroymashina", Khar'kov "Konditatsioner", Dnepro "Strygigravlika", Minsk "Uzarnik", and the Mostroma Heating Element Plant and others. Their share of production of the highest quality equals 90 to 60 percent of the total production volume. In the industry as a whole, this constitutes 19 percent.

However, it would be incorrect to close ones eyes to the fact that lagging enterprises do exist, enterprises which impede or are lagging in the preparation and implementation of a comprehensive quality control system. Fifty plants of Minstroydormash have not yet certified a single item model for the State Mark of Quality. Such enterprises number seven of 17 in "Soyuzekskavator" and eight of 19 in "Soyuzdormash".

Recently, as the result of non-quality machinery manufacture and equipment building, Gosstandart (State Standard) organs have applied economic sanctions against: the Orlov "Dormashina" Association, and the following plants--Irpen' Peat Machinebuilding, Kishinev "Ektromashina", Sverdlovsk Municipal Services Machinebuilding. Numerous complaints have been levied at the Kamyshin Crane Plant.

Production resources within the industry are being expanded and replaced. This year, 42 sites are to be placed in operation. Among the most important to be commissioned are the top-priority plants for concrete carriers and concrete pumps in the city of Tuymazy (Tatarskaya ASSR), the Balakovo Self-Propelled Earthmoving Machinery Plant, and the foundry complex at the "Volgotsemash" plant. In the city of Tol'yatti, the steel-casting shop of the Voronezh Excavator Plant, and the second-priority Mogilev Elevator-building Plant and a number of others. Work at several sites is still progressing unsatisfactorily. The efforts of contracting organizations might be focussed, and uninterrupted flow of materials must be guaranteed here, and the delivery of all needed equipment guaranteed.

Workers in the construction, roadbuilding and municipal services machinebuilding industry have established as their 1979 goal the exceeding of the assignment for labor productivity and profit growth, to develop series production for 79 new machines and equipment, to produce an additional 20 million rubles of basic production over plan, to conserve 10,000 tons of ferrous and

non-ferrous metals, 45 million kilowatt hours of electrical power, and 5,600 tons of fuel. To successfully fulfill the obligations assumed and to work without lags, this is matter of honor for every production collective.

8851
CSO: 1821

CONSTRUCTION, CONCRETE MACHINERY, AND BUILDING MATERIALS

DEVELOPMENT OF POWER MACHINE BUILDING

Ministry ECONOMICHE-KAYA SPRINTA in Russ, in № 27, Jul 79 p 2

Article by V. Krotov, Minister of Power Machine Building in response to the review of: "Development of Power Machine Building"

Text In the review of "Development of Power Machine Building" published in the № 22 edition of "Economic Magazine", it was justifiably noted that several of this industry's plants failed to fulfill plans for product range during the first months of this year. In the discussion of operational results for the first quarter, the ministerial collegium ensured the directors of those enterprises allowing these lags.

Time-periods for the make up of under-deliveries were established for each production association and plant. It was proposed that the "Khar'kov Turbine Plant" Association radically rectify the situation regarding the delivery of spare parts, that the Podol'sk Machinebuilding Plant imeni Orzhonikidze deliver a steam generator with full fittings to the USSR Ministry of Power for the Beloyarsk Atomic Electric Power Station in July, etc.

At the same time, considerable work is underway to improve quality, reliability and economy of electrical equipment. The proportion of production bearing the highest category of quality to the total volume of production in the ministry compared to 1975 grew by a factor of two. Programs are being administered to further improve the technological level of thermal-mechanical equipment manufactured, as well as its reliability. For the construction of a GRES (State Regional Electrical Power Plant) fired by Kansk-Achinsk Basin coal, equipment is being built for a power unit rated at 800,000 kilowatts. Simultaneously, a system of scientific research and experimental design work is being conducted to build small-scale boiler assemblies for units of the same capacity. Improved coal-pulverizing equipment is being developed (medium speed mills) corresponding to the best foreign comparable equipment. A decision has been made to concentrate all scientific-research and planning-design operations in this area within the sector's lead institute.

The directive regarding Minenergomash and Minenergo, USSR, has provided for programs to improve technological levels and quality of component boiler and turbine equipment for thermal electric power stations. Technical documentation has been prepared for the modernization of existing regenerator water-feed preheaters. Additionally, a transition is being readied to the manufacture of new preheaters for units with capacities ranging from 500 to 800 thousand kilowatts with small diameter pipes, which will substantially increase their service life. In 1980, manufacture will begin for more reliable and efficient open-feed water pre-heaters which will result in the saving at every power unit of up to 20,000 tons of conventional fuels (300,000 kilowatt power installations).

8851
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CONSTRUCTION, CONSTRUCTION MACHINERY AND BUILDING MATERIALS

WEAK MANAGERIAL PRACTICES IN CONSTRUCTION SCORED

Moscow LITERATURNAYA GAZETA in Russian No 29, 18 Jul 79 p 10

[Article by B. Nikolayev, engineer-builder: "Tufta"]

[Text] The author of this article worked for more than 20 years at construction projects as a work superintendent, chief of a sector and deputy chief engineer for a construction administration.

The incidents of eyewash and inefficient use of construction materials described by him occurred in those areas where the personnel chose to ignore the progressive methods for carrying out the work, the brigade contract method of A. Zlobin, the 'work competition' and other leading methods being used in construction, methods which have proven to be effective for realizing savings and accelerating the placing in operation of projects. Situations described by the engineer-builder result not only in greater material expenditures but also in moral losses.

The end of the month at the construction project was almost like the end of the world. The brigade leaders and workers had but one concern -- to close out the orders. A fermentation of minds was taking place on the floors, as well as wild discussions concerning earnings. Below, express messengers were racing to the rate fixer to obtain information. Usually the brigade leaders did not tolerate such liberties. However, they now leave their work positions and rush to their offices, while clanking their chains, in order to attack the plague infected work superintendents.

"We were idle for 5 days. Was the brigade at fault? When will the solution be delivered? The solution should have been processed -- some sand, but the shovels were not used!"

"I believe that everything was according to the fifth category -- should I have pulled the carpenter along to the sixth floor?"

"I waited 2 weeks for these columns and I installed them in just three shifts. And you are closing the rate on me? Why must the brigade suffer? Tomorrow the entire brigade and I will go to Semenov. Semenov does not close for less than 9 rubles per day..."

This was the voice of Mikhalych, the best brigade leader of our construction administration. Although he is noisy at times, he nevertheless is an obliging and reliable worker. I open the door of the office and suddenly I hear impassioned voices subsiding in the reception room. I address all with a friendly "Greetings!" and invite Fedorov, a recent graduate of a construction institute, into the office.

"Come in with Mikhalych!"

Fedorov is aware of why I invited them and without uttering a word extends to me the order of the brigade leader. I cursorily examine the sheet in my hands and state as pleasantly as possible:

"Mikhalych, tell me what is not written here. What has been omitted? All of the work -- according to the highest rate!"

"I will look here" stated the brigade leader as he studied the summary line, "Here! Look yourself here! The earnings are not mentioned!"

It is difficult to argue and it is difficult to see; the earnings were not "mentioned": with all interpretations -- 4 rubles per day.

"Forty two kopecks will not suffice" stated Mikhalych sarcastically, "Do not be offended, I will go to Semenov."

I have known Mikhalych for more than 1 year. I value him as a fine brigade leader and as a rank and file builder. It is to such brigade leaders that the directors and chiefs of the main administrations turn in behalf of the homeland and at ceremonial meetings they sit alongside them in the presidiums. I know what I will say to him now.

"Go ahead Mikhalych. The work superintendent and I will examine the matter once again."

The brigade leader leaves us to ourselves. I ask the work superintendent:

"The arrangement of the forests -- how many were drawn for him? Thus, multiply by three! What does it mean -- how much did he fail to do? Do or not do, who will keep count? Add also the removal of ice and snow from the forests and the scattering of sand..."

Fedorov's ears sparkled light stop signals, as he shook his head.

"There was no snow or ice conditions."

"Thank God," I mutter, "we still are not attaching weather summaries to the orders... And record once again the manual processing of the frozen soil. Using a wedge and sledge hammer. And the installation of scaffolding, with subsequent dismantling and removal..."

"And still one other factor" he adds, "the removal of the smoke using bags."

I raise my eyes in surprise. The work superintendent looks me straight in the eye and did not dodge my glance.

"At the present time, you will say" I said to him, "that you were not taught this at the institute."

"That is correct. They did not teach me!" such was the tone of his reply.

"Nor did they teach me" I sighed in a sincere manner.

Honestly speaking, I liked the intractability of this young work superintendent, young compared to myself. I view in him my own youth as a work superintendent and the sharpened sense of fairness that I possessed at that time. It would be simple for me now to tell him about this and to mention that when correcting the orders neither he nor I should deposit one state kopeck in our pockets. Further, in displaying concern for the earnings of the workers, we devote primary attention to the fate of the lines and to the timely placing of projects in operation, including housing that is being eagerly awaited by many people. This is what I was told upon arriving at a construction site following my work at an institute. Similarly, this is what I told those who subsequently came under my jurisdiction. But on this occasion for some reason I did not choose to raise this subject. Perhaps it was because Fedorov's ears were already burning to an excessive degree.

"Good" I stated in a conciliatory manner, "I will negotiate directly with Mikhalych. And on the following day we will transfer the brigade to the new project. Were you aware that this is a non-standard project? The work is already completed there and the time has come to promote Mikhalych."

Non-Standard Project

Among other distinctions, construction projects are still being sub-divided into standard and non-standard types. For example, a standard project could be a polyclinic capable of handling 150 appointments daily, as checked, analyzed and approved at all levels. The structures, parts and units -- everything right down to the latches on casement windows, in accordance with such a plan, is delivered to the construction project by means of an industrial conveyor line, or more accurately, a production line. But it is generally well known that the obstacles lying along the path of a conveyor line can transform it into a deluge. Thirty "pencil" cross-pieces were not received on time -- the installation of a wall has come to a halt and the

construction site is being flooded with materials. Initially these materials form intolerably high piles and subsequently -- mountains of bulk materials. The delivery of upper building structures earlier than lower ones is also a very mysterious phenomenon and one almost as vexing as the notorious Bermuda Triangle.

In short, a great blessing and powerful accelerant for a construction project -- an industrial flow line -- is transformed into a deluge and thus becomes an evil. The first symptom of this -- is forced idle time. But indeed the workers receive pay for forced idle time -- thirty seven and one half percent of the wage rate. This is approximately five times less than the usual average earnings.

Moreover, what sources are to be used for paying for lost working hours, days and even weeks? The wage fund is computed as a firmly established percentage of the value of the work completed. If work is turned over for operation (often signified by the signature of the customer) at a cost of 100,000 rubles, one is entitled to expend 15,000 for wages. But what if the work was not turned over for operations? What if the sub-contractors did not carry out their work, ceiling material was not supplied by a reinforced concrete products plant and the deliveries of crosspieces were disrupted? The construction project would become paralyzed and the wage fund would become frozen at a definite level. But the builders can always find solutions for their problems. They are often assisted by non-standard projects, where work can always be found or at least thought can be given to the work yet to be carried out. In this manner they can obtain additional wages from the construction administration.

This is why the inclusion of a non-standard project in a plan, be it for the modernization of an old municipal bath or the erection of a new plant building, is considered mainly to be a search for reserves for increasing the wage fund. And more exactly -- the right to expend it for other standard projects.

This is why the builders recall for years those non-standard projects which were especially profitable and in the process they resembled gold miners and their kilogram nuggets. The non-standard projects are truly similar to gold nuggets. The overall plan of a construction administration has cracks in all of its seams and the wage fund is exhausted in like manner as a well during the dry period of the year and suddenly a non-standard project valued 200,000-300,000 rubles more than the planned cost is turned over for operation. The plan is saved, the brigade which had been forced into a period of idleness is no longer offended and other indices are saved. This also improved the prospects for bonuses.

True, the inclusion of a non-standard project in the plan is not everything. It is nothing more than a promissory note on the basis of which one will obtain his percentages. The amount of these percentages is not determined in advance and can even be dependent upon such non-economic categories as conscience. At times, they may even be dependent only upon such categories.

Guardian Angel

The table of organization of every construction administration lists the position of engineer-estimator. It is an inconspicuous and unpromising position with regard to further advancement in service. But when the time comes for such an individual to carry out his functions....

"Raisa Palna" mutters the leader of the construction project into the receiver, "You are our guardian angel. All of our hopes rest with you. Yes, non-standard projects... It bears mentioning that in September we will have passes to the Crimea; we will help you regain your strength. You must take them; it will cost you nothing."

What is true, is true. At times it is impossible to establish the value of a contribution made by estimator Raisa Palna towards fulfilling the plan. Her system was developed almost with biological perfection.

Raisa Palna is given a separate office. Her telephones are switched off, a hospital silence reigns, strong tea is available and a secretary stands guard. During a period of one and a half months, Raisa Palna must examine and revise that which numerous departments of a planning institute worked on for a year. Layers of documents lie in front of her. She solemnly unravels each mystery, while now and then uttering such terms as "soils, engineering geology..."

The following information appears in the estimate: foundation on a firm base -- sand, clay... There is a catch: why are there no quicksand areas or karst caverns requiring filling in with imported soil? Why clay and not basalt, granite or boulders at the worst? On a separate sheet the lines are squeezed close together -- written in longhand: "Removal of boulders using explosives... Erection of temporary shelters and protective means for extinguishing the blast wave..." The plan calls for the soil to be worked using an excavator. The rates are ridiculous! No, it will no do. Something more laborious in nature is required. Raisa Palna mentally crosses herself despite the fact that she is a non-believer and she writes: "The upper soil layer to be broken up using a ball-drop weight."

Now work can commence in connection with crossing a water obstacle along the path of a heating line. What type of inverted siphon and how will the dragging across the bottom be carried out? Only caisson tunneling is considered to be desirable through the moraine. And a minimum of mechanization -- manually, manually, manually! The crossing over the highway? And where are the detour roads and the installations for draining off flood waters? Where is the water drain for the trenches and where is the grooved protection; could it be on both sides?

After the usual amount of time has elapsed, a large volume of "Comments" and in any case a second volume of "Estimate for Filler," corrected by Raisa Palna, appear on the director's desk. The latter was prepared using

the form of the planning institute. Why should the estimators be bothered with excessive work and why should they have to spend time recomposing and reprinting the estimates?

The director leafs through an estimate, while reproachfully shaking his head. He asks:

"Did they go to extremes? Will there not be an excess of work? Indeed, they are not children there! Perhaps it would be more suitable for the deputy or chief technologist to sign? It is in line with their responsibilities."

The doubts are overcoming and they torture his soul; he makes no attempt to sign! The director understands that the solid portfolios contain soap bubbles and tuft. No shame is involved in bringing the matter to the highest level of management. But what if it is brought to Stroybank? The control measurements and the total amounts removed. But on the other hand it is necessary to patch up the holes, cover the over-expenditures, pay the brigades for their forced idle time and climb up and away from those who have fallen behind. The personnel must be retained at the construction project.

"Do not become alarmed" states Raisa Palna, "The visas have been collected. I have prepared everything -- from soil geology to additional safety measures. In some areas we may have to yield, since the planners also have their pride. This is something that I do not conceal very well.

Taking the customer and the signed "Comments," Raisa Palna departs for the planning institute.

Gip-Gip, Hooray!

The chief engineer for the plan, whose abbreviation is Gip (glavnnyy inzhener proyekta; chief engineer for the plan) and who bears full responsibility for the estimated cost of the project, shudders upon seeing Raisa Palna standing at the threshold, knowing full well that a battle is forthcoming. The "Gip" entertains no doubts regarding the fact that the upcoming skirmish will involve several rounds. Alas, he is all too familiar with his opponent's methods.

Following the exchange of courtesies, the "Gip" sends his guest out into the departments. The estimators glance at Raisa Palna in the manner of rabbits eyeing a boa constrictor. How can their cautious paper souls, enslaved by tens of thousands of paragraphs, compete against the boldness, assertiveness and unfettered imagination of Raisa Palna?

"A crossing over a highway requires the installation of temporary access roads" Raisa Palna began, "with side ditches and reinforced concrete

installations for drawing off rain and muddy waters. Who is responsible if it is a republic highway or an oblast highway? Your information is obsolete! It recently became a republic highway! If this highway becomes paralyzed... Who signs?"

No, the "Gip" will not sigh. He will not take the risk.

Kaisa Palma returns to the administration on a white stallion bearing a shield, that is, with the approved "Comments" and a new estimate. It is the end of the battle and the end of the doubts. Everything has now been estimated and noted; it was all done on the sly. It is now possible to work without having to glance at the wage fund or other prose, to deal with the mechanization and motor vehicle pool administrations (allow them to draw up their own plans), without being stingy or resorting to the splitting of hairs to make payments for insufficient amounts of concrete delivered and unsuitable solution, and to forget about pipe, posts, pilings and other items of secondary importance that were rejected in various areas.

None of these items of secondary importance are included in the balance. They are listed as being used at a project when installed as lines of communication, under foundations or for temporary spur track. Their material cost amounts to hundreds of thousands of rubles and only one requirement remains paramount -- at any cost, to obtain 115 percent (15,000) from each for the wage fund, to use this addition for covering the forced idle time of innocent individuals such as Brigade Leader Mikhalych and to retain at the construction project the master-crane operator who, on the day that he was paid, announced that he was departing to work at a beer stall.

Accounting For Waste

I travel through the city over a well known route. I know each house on the street, at one time they were all construction projects of mine. Nor ~~am I~~ ~~part~~ ~~interested~~ as I pass by my "former" projects -- I necessarily link them over "from head to toe."

Here is the school. Young boys and girls are creating a hubbub and swiving their briefcases. Alongside there is an ice rink where some players are curving a puck. Was it long ago that the iron neck of a tower crane was in operation here. Was it long ago that passions boiled over: ~~likhach~~ ~~likhach~~ -- ~~likhach~~ ~~likhach~~ -- threatened to go to Semenov, who "withdraws" 9 rubles daily and Work Superintendent Fedorov, who only arrived after compiling its were at a YUZ, stood his ground with the persistence of Anyukov: "I will not sign! They did not teach me this at the institute!"

Presently, other passions boil over here: the briefcases are thrown aside and a soccer game unfolds on the ice.

But what is this? I could hardly rise from my chair -- the hockey rink was surrounded by an extensive concrete wall. "We did not do this" I recall. And immediately I conjecture: somebody did this without assistance from

us the builders; they used slabs which we had discarded and used them to form the guard rail.

In the region of new construction projects, I try not to look out the window of the automobile -- traces of our construction mismanagement, visible consequences of tufta, are apparent everywhere.

The dumping ground for bulldozer damaged reinforced concrete, broken pipe and rusted hardware rise up in the manner of burial mounds. And under each broken slab is buried not only the labor of tens of people but also respect for labor, for material values created by the hands of man and for our national good.

And here is a former non-standard project -- a new plant department. The same type that was designed was built -- no longer, no higher and no larger. But it cost the customer 600,000 more rubles than the original estimate: coefficients for crowded work conditions were introduced without a bit of ceremony, corrections for "local conditions during the removal of flaws in the building system, before which the conditions for cleaning the Augean stables appear dim, the pumping out of ground water which in all probability has never been seen here since the flood, temporary roads which never existed even temporarily.

With these 600,000 rubles, the plant could build a recreation base or a young pioneer camp, but for the fact that the money was consumed by tufta.

Tufta -- the offspring of our operational waste. Sober accounting is required for waste.

7026

CSO: 1821

ELECTRONICS AND PRECISION EQUIPMENT

DEVELOPMENTS IN EXTREMELY HIGH PRECISION FOR INSTRUMENT CONSTRUCTION

Moscow IZVESTIYA in Russian No 163, 15 Jul 79 p 2

[Article by A. Murashkin, doctor of technical sciences, professor, Polytechnic Institute imeni M. I. Kalinin, Leningrad]

[Text] Development of instrument construction for new technology demanded a sharp increase of the country's production of small ball bearings known as instrument-grade ball bearings. Such bearing must meet very high demands for accuracy of rotation, noise characteristics and other major parameters. The basic parts which determine bearing quality are manufactured with a precision of shape to within two ten-thousands of a millimeter, and their working surfaces are polished to mirror clarity.

Until recently, there were no domestic machine tools for finishing the races which could attain this precision. In addition, there were no stable technological processes to even approximate the required precision of treatment. The staff of many scientific research and industrial groups have worked to design such machine tools, namely the All-Leningrad Special Design Bureau of Grinding Equipment, the plant imeni Il'ich of Machine Tool Construction, the Association imeni Sverdlov and the All-Union Scientific Research Institute of Abrasives and Grinding (VNIIASh).

No less complicated tasks had to be solved for workers, master technicians and production organizers in assimilating serial production of machine tools. It was not easy to introduce this equipment into operation and then improve it.

The responsibility was tremendous. Assignments for development of production of instrument-grade bearings and equipment to manufacture them have been received in the Basic Trends of Development of the USSR National Economy for 1976-1980. Assimilation of serial production of equipment was included in the socialist obligations of Leningrad and the Leningrad oblast.

Today this extremely important problem has been solved. High-efficiency equipment has been designed, assimilated in serial production and placed into operation. It provides the necessary precision of treatment on a modern technical level, i.e., with complete automation of high-precision processes. All machine tools bear the honorary pentagon—the State Seal of Quality.

Work performed is based on the comprehensive utilization of modern achievements of science and technology. Ultrasonic oscillations have been employed. They permitted attainment of stability and controllability of the process of treating races with diamond whetstones. These same oscillations, applied to supports on which the race rotates during treatment, permitted reduction to one one-hundredth of the magnitude of friction between the race and its support. More precise chucks have been designed. Optical means have been successfully used for aligning machine tools and for observing the process in extremely tight working spaces.

Many technical answers have been recognized as inventions. Thirty patents obtained by work participants, on one hand, indicate the newness of the problem under solution; on the other hand, they indicate the high scientific and technical level of the solutions themselves.

The design of new machine tools and assimilation of serial production permitted solution to an important national economic problem. The need to import similar equipment from abroad has diminished—theirs is now inferior in precision of treatment to domestically produced machine tools. Results obtained in the work process may be used—and already have been successfully used—to solve other problems of finishing treatment of small parts. Suffice it to say that at the Special Design Bureau of Grinding Equipment, work is being concluded on a high-precision automated machine tool for grinding small diameter drill bits. Designers of the plant imeni Il'ich, upon request of physicians, started to develop a design for a machine tool to grind more precision miniature parts for the artificial heart apparatus.

8617
CSO: 8144/1701

METALLURGY

NEED TO CONSERVE METAL AT KRAMTROSK MACHINE BUILDING PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 23 Jun 79 p 2

[Article by V. Aleksandrov, chief engineer of the Production Association "Novo-Kramtorskiy Machine Building Plant", Kramatorsk: "Saving Metal: We Find and Lose"]

[Excerpts] Machinery and equipment bearing the mark NKMZ [Novo-Kramtorskiy Machine Building Plant] are known in many Soviet cities and abroad. We expend annually more than 250,000 tons of metal in their production. Approximately one hundred metallurgical enterprises supply us with metal. There is hardly anyone at the association who does not directly or indirectly come into contact with this material.

The conservation of metal is a complicated problem. We are working in many directions to make efficient use of our metal resources.

One way to conserve is to raise the per-unit capacity of new designs that are being created while lowering their relative metal-intensiveness at the same time. We are speaking about increasing the efficient use of each kilogram of metal that goes into a machine. In recent years this indicator has increased by more than 20 percent.

Last year the designers came up with a rotary excavator, the ERShRD-5250, for the Kansko-Achinskii complex. Its relative metal-intensiveness was 20 percent lower than the ERShRD-5000 rotary excavator that was previously manufactured - and its productivity was 5 percent higher. In other words we saved 800 tons of metal by improving the quality of the design of the assemblies and parts of the excavator.

More than 100,000 tons of metal per year alone are saved by raising the precision of rolled metal on the rolling mill "2000" of the Novolipetsk metallurgical plant.

We want to receive metal of a specific length, width and quality. It often happens that we are confirmed for sheets of metal of other dimensions and must take what we are given. Moreover our use of rolled metal is sharply decreasing, metal intensiveness is increasing and production cost is rising. I might add that the suppliers postpone delivery dates at their discretion.

The consequences of the arbitrary substitution of one metal for another are eloquent testimony to this fact. Pipes with a 530 mm length and a 7 mm wall thickness are required for the boom constructions of the excavators that we manufacture. The Chelyabinsk pipe rolling plant supplies us with them. For a long time things were fine. Then we find out that they have changed the terms of the supply orders and will be supplying us with pipes with a wall thickness of 8 mm. It would appear that this is not a very large increase and that it will n't cause problems. However, this is only as it seems. In a machine everything is joined together by the design. Having changed the dimensions of one part, the designer must recalculate the others. It turns out that the increase in the pipe's wall thickness by only one millimeter increases the total weight of the machine by more than 5 tons! For this reason alone the machine builders are overexpending 150 tons of metal per year. All of our protests on this matter have remained unanswered. But the Chelyabinsk pipe rollers have not stopped here. The last batch of pipes that they sent us had a wall thickness of 9 mm. This exceeds the limits of propriety. We were forced to return this product to the suppliers.

What causes such things to happen? They are caused by the fact that the metallurgists are reporting only gross output. It has been written over and over that the USSR Ministry of Ferrous Metallurgy should increase the motivation and responsibility of all of its collectives to precisely fulfill their customers' orders, for this is dictated by the urgent requirements of industry on the whole. Unfortunately, work in this direction is being performed very poorly. Over a long period of time there have been no significant changes in the grades and mechanical properties of the steels that heavy machine building receives. Today low alloy steels with a yield limit of 40 kilograms per square millimeter are the basic material for manufacturing basic units of metal structures which function in conditions of dynamic loads. The steels with a yield limit of 60 kilograms that have appeared have not found wide application because of their high cost and also in connection with the increased sensitivity to the concentration of stress.

Table rolling conveyor devices, for the manufacture of which hot rolled thick walled pipes are needed, are extensively used in rolling mills. It is this very material that makes it possible to simplify the production of manufactured articles and to improve their operating characteristics and to conserve metal. The benefits are on hand. However, we, the machine builders, rarely receive these pipes and manufacture hollow rollers out of forgings or cast pipes. If one considers that we produce thousands of such manufactured articles, it is easy to imagine all the ways possible for conserving metal.

8927

CSO: 1821

METALLURGY

BRIEFS

ROBOTS AT WORK—Automatic manipulators have been put into operation where the molten metal flows and the ingots glow white hot. They service a complex-mechanized chill mold line at the Odessa agricultural machine building plant imeni October Revolution. The automatic foundry hand in accordance with an assigned program, calculated to the fraction of a second, pours the metal into the forms in precise portions while a second robot extracts the incandescent ingots from the forms and feeds them into the thermounits. As they exit from the ovens the ingots are met by a third manipulator, which makes the hot ingots into stools. Within an hour this brigade turns out 115 ingots. The complex-mechanized line, which is serviced by three robots, has freed more than 100 foundry workers from heavy physical labor. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Jun 79 p 2] 8927

ROBOTS AT THE SMELTING OVENS—Foundry workers at the Khar'kov Electrotechnical Plant have handed over to robots their watch at the white hot smelting furnaces. Three brigades have been freed from heavy physical labor in a hot shop and now are beginning to service the automatic equipment. The section of industrial robots, which was organized by the council for assisting scientific-technical progress under the city party committee, helped to reduce by six months the adoption of progressive equipment. It combined the efforts of collective institutes, which created the manipulators, and the plants where they must operate. The section studied the work conditions in all foundry, forging, thermic and stamping shops of the city. Technological charts for improving production were compiled for each enterprise. On the basis of these charts the institutes received assignments for designing new equipment. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 27 Jun 79 p 2] 8927

VORONEZH METALLURGICAL EQUIPMENT PLANT ENLARGED—At the Voronezh Forge-and-Press Equipment Plant the capacity to produce 100 forge-and-press machines each year was put into operation ahead of schedule. The collectives of the Voronezh construction administration of the USSR Ministry of Construction and the Yugovostoktekhmontazh trust labored successfully here. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 20 Jul 79 p 1] 8927

AUTOMATED SYSTEMS EMPHASIZED IN INSTRUMENT BUILDING INDUSTRY

Moscow EKONOMICHESKAYA GAZETA in Russian No 16, Apr 79 pp 1-2

Article: "Development of Instrument Building--The Five-Year Period, Year Four"

Text Instrument building is part of an industrial complex which constitutes an accelerator of scientific and technical progress in the entire national economy. A large capacity basis for the production of modern computer technology, the newest equipment for automation of production processes, product quality control and the output of telemechanics and data processing equipment has been created in our country through the efforts of the Communist Party and the Soviet Government.

Enterprises of the Ministry of Instrument-Making, Automation Equipment and Control Systems are simultaneously making an important contribution towards satisfying the population's demands for such goods as watches, household appliances of every description, pens, jewelry and other items. In over-all volume of production the proportion of articles for cultural and personal purposes and for household use exceeds 30 percent.

Out of all machine building sectors, instrument making is developing at the most rapid rates in the 10th Five-Year Period. Data indicate that for the first 3 years of the Five-Year Period the over-all volume of production at enterprises of the Ministry of Instrument Building increased by 36 percent in comparison with 1975: the growth of production (considering 1975 as 100 percent) was 111.9 in 1976, 124.3 percent in 1977, 136.6 percent in 1978 and 148.8 for 1979, while labor productivity (again considering 1975 as 100 percent) was 110 percent for 1976, 120 percent for 1977, 131 percent for 1978 and 141 percent for 1979. Both volume of production and labor productivity exceed the level established by the Five-Year Plan for the first 3 years. The output of articles of popular consumption increased by 25 percent, and the profit goal was overfulfilled--it rose 95 percent.

In the current year, instrument building continues to develop at rates which outdo themselves. The over-all volume of production is predicted to increase 8.9 percent as opposed to 1978, which is higher than the Five-Year goal for 1979. Meanwhile, the output of mechanization and automation equipment for management and engineering is growing by 17.9 percent, output of instruments for measuring mechanized values by 14.6 percent, and the output of instruments for the control and regulation of technological processes by 12.5 percent.

A task of paramount importance for sector workers is the organization of production of new instruments and systems with improved technical features permitting an increase in the effectiveness of automation in the national economy. Around 780 new articles are set to go into production during the course of the year. The proportion of State Mark of Quality production in the over-all volume of production is projected to reach 31 percent (in percentages related to the general volume of production, growth of production output with the State Mark of Quality was 8.5 percent in 1975, 12.1 percent in 1976, 17.6 percent in 1977, and 25.3 percent in 1978).

A course is being followed for further development of the production of instruments of automation equipment and computer technology on the basis of micro-electronics. The national economy will receive--originating from this base--new management computer systems, automated management systems for technological processes, gas analysis instruments and multipurpose testing machines.

Capital investments in sectors are being directed first towards increasing the production capacity of computer technology equipment, technological process control and regulation instruments, and goods of popular consumption. With this, 59 percent of allocations for industrial construction is being spent, according to plan, on technical re-equipment and reconstruction of existing enterprises.

Having promoted mass competition for ahead-of-schedule completion of the 1979 plan, instrument makers successfully fulfilled the first quarter's goal. Volume of production increased by 8 percent in comparison with January-March of last year. Work productivity rose by 8 percent. The quarterly plan for sale of production was fulfilled by all enterprises with the exception of the Khar'kov Control and Measuring Instruments Plant and the Ufa Geophysics Instrument Building Plant.

REVIEW

All 13 of the all-Union industrial associations under the Ministry of Instrument-Making are fulfilling the goals of the Five-Year Plan. The industrial association collectives of the Leningrad Electro-mechanization

Plant, the VILAT "Promstroy" and the VILAT "Promstekhnika," the Moscow "Manometr," the L'vov "Mekanizm," the Second Moscow Clock Plant, the Leningrad scientific and production associations "Miravestnik" and "Lenteplastik" are in the forefront of socialist competition.

The innovation of workers in Rostov--"Work without Laggards"-- found practical support in the sector. Thanks to systematic dissemination of advanced production workers' know-how, the number of workers not complying with output norms has dropped during 3 years from 14 to 8 percent.

Nevertheless, there are still enterprises which have lagged behind in the general forward movement. Among these are the industrial associations, "Promprapor," of Tallin and Cheboksary, the Mogilev-Podols'kly instrument making plants, the Nevinnomysk electronic measuring instruments plant, the Ufa geophysics instrument making plant, the Khar'kov control and measuring instruments plant, the L'vov mechanized plant and several others. Last year, six enterprises did not achieve the target growth in work productivity, and thirty enterprises did not fulfill their profit plan.

VIA ROUTES OF TECHNICAL PROGRESS

At present, the usage system of industrial instruments and Automation Equipment is undergoing development. It includes a complete selection of technical resources for receiving, transmitting, processing and utilizing production information which allows creation of an automated management system for technological processes of various grades in all sectors of industry.

Significant growth in the production of technical means for the Automated Management System for technological processes has been achieved in 3 years. In all, around a thousand types of new articles are set to go into production during the Five-Year period. Development and organization of the production of instruments and automation equipment and, above all, of integrated complexes within the limits of a single state system will ensure an increase in the efficiency of technological processes' automation in industry. For example, a complex of pneumatic converters which measure 9 parameters with great precision in especially corrosive productions has been created. The complex, "Sapfir," based on a micro-electronics facility, includes 10 types of measuring converters. The integrated complex of electric means of regulation answers all requirements for increased reliability of automated control systems for technological processes in various sectors of industry.

Complex lines of indestructible quality control of metal articles, constructed according to an integrated principle, are being in-

troduced in automated production facilities in the iron and steel industry and in machine building. A system of continuous-flow quality control for the surface of cold-rolled strips from low-carbon steel has now been introduced at the Magnitogorsk combine. Automated line complexes of control have been designed for the Chelyabinsk and Sinarskiy pipe plants and for the Zhdanov plant "Azovstal'."

COMPUTER TECHNOLOGY FOR ALL SECTORS

Since the beginning of the Five-Year Period, the production volume of computer technology equipment has increased by 60 percent instead of the 44.6 percent set by plan goal. The output of small computers forming a part of a single system for all socialist countries is being developed. Machines of this system have been designated for use in automated management systems for technological processes of diverse sort and for the automation of scientific research, for information processing in management systems of non-industrial projects and, similarly, for solving small-volume problems of computable nature. In 1976-1977, four first-line models of the small computer system were developed, and their series production began. In the period 1978-1980, second-line machines of the same grade are being created.

New peripheral equipment for computers and computer management complexes are being perfected and developed.

The growth of production for small single system computers and component equipment is, however, insufficiently provided with complete assembly parts and high-quality materials. Several problems involving computer production technology have not yet been solved. The reliability and operational indicators for production technology need to be improved.

A great deal of work is going on in the area of technical means for scientific research. Their products list has already exceeded 500 descriptions. More than 30 scientific research institutes and design offices of the Ministry of Instrument-Making are occupied with the creation of equipment for fundamental and applied research. Many developments are being carried out jointly with organizations of the USSR Academy of Sciences, the Ministry of Chemical Industry, the USSR Ministry of Geology, the USSR State Committee for Hydro-meteorology and Control of the Natural Environment and others.

Before the end of the Five-Year Period, around 180 types of new instruments for scientific researchers will have been developed, and the volume of their production in 1980 will rise 1.7 times in comparison with 1975.

A crucial question is how to increase the scope of applying more instruments and also expand the market for agricultural and increasing their use. The above-mentioned tasks are basically being fulfilled. Specialized laboratories of two types for soil analysis have been organized. The organization, "Grozny-1," for determining the chemical nutrition and residual resource of soil, and the "Grozny-2," is being put on the market. Work is being done to expand the chemical services, which is to be continued.

The Ministry of Environment and together with five other ministries are participating in the accomplishment of an overall program for specific technical means for environmental preservation. The multi-year work is to be carried out likewise within scientific and technical cooperation units of member nations of the Commonwealth of Independent States, sector enterprises and organizations, and types of instruments for control of air emissions and gas emissions and of surface and ground water. At the end of the Five-Year Period, the number of new types of instruments is planned for design in the country.

Unfortunately, this was not the case. Despite the lack of sufficient scientific advantages, the USSR Academy of Sciences carried out a series of fundamental and applied researches in the USSR Academy of Sciences in the field of space exploration.

INCREASING EFFICIENCY IN THE AIRPORT

The growth of the
of Instrument-making
quality.

Considerable success was achieved by the "Soyuzelektron" highest-category "Soyuzprompribor" enterprises and "Soyuzavtomash" State Mark enterprises. Meanwhile, the enterprises organized at the "Soyuzchashchad" proportion of 50 percent of the original five-printed emblems and 50 percent of the substitutes 17.4 and 17.5 percent.

A goal of sigmoidology is to cultural and educational institutions established for this end. As a result, the movement has proved. Experts in the various

the extended for
the last one-
year period
had im-
proved exporting

watches, our country occupies third place (after Switzerland and Japan).

For 1979-1980, all-Union associations developed and have now undertaken realization of plans for putting into production new consumer goods of improved quality. Among them are the digital computer, "Shkol'nik," group testing devices for students, electronically-mechanized quartz wrist-watches (this model is being put into production first), an electric razor with universal power supply and other things.

The improvement of production efficiency and work quality is connected with step-by-step refinement of the cost accounting principles of management, planning and financing which are being practiced in the sector. The Ministry of Instrument-Making does not receive allocations from the State budget, and all expenses for expanded reproduction are met via the portion of profit remaining (in accordance with established norms) at the disposal of the sector, and similarly, via amortization allowances and other internal assets. Planning of projected labor-intensiveness of new articles and deadlines for its implementation and, similarly, a degree of mechanization and automation of labor-consuming operations, has been introduced. The level of mechanization of labor in instrument-making has now exceeded 57 percent.

The procedure for formation of the unified fund for scientific and technical development has been improved in the sector. Whereas earlier it was formed via deductions from profit and production cost, deductions will now be made only from the planned profit of the enterprise.

An important role in refining organizational structure is being assumed by the "ASU-Pribor" [Automated Management System Apparatus]. Created on a third-generation computer facility, it enables the solving of operational management problems involving enterprises and organizations, material, labor and financial resources, sale of finished products, capital construction, scientific and technical progress and product quality. Next comes further development of "ASU-Pribor" and the creation of an integrated automated system, providing optimum linkage of automated management systems of enterprises, associations and the sector into a unified whole.

The general economic effect of efficient management, taking into account the introduction of automated management systems and improved production organization, constituted 21 million rubles in 1978.

Specialization of enterprises is developing and being extended, which positively influences improvement of instrument-making efficiency. Thirty enterprises and 122 specialized shops are now occupied with centralized production of units and parts and, similarly, of casting and fastening parts. The share of their production output in overall production volume in 1979 comprises 12.1 percent compared to 2.5 percent for 1975.

Consolidating and intensifying competition through socialist competition for leadership in efficiency and quality, instrument-makers pledged themselves, in the 4th year of the Five-Year Period, to overfulfillment of the plan for all technical and economic indicators and to additional product sales of not less than 25 million rubles with a profit of 5 million rubles' profit. Developing and introducing into industrial use 180 automated management systems for enterprises, production associations and districts, and 1000 for recovery of the cost of plant construction. A 10 percent increase has been set as a goal. Most competition in the sector is having an ever more activity and tempo.

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METALWORKING EQUIPMENT

CENTRALIZED MANAGEMENT NEEDED IN MACHINE TOOL OPERATIONS

Kiev RABOCHAYA GAZETA in Russian 23 Mar 79 p 2

Article by inspection team composed of M. Bassarab, Head of the Division of Heavy Industry of the Municipal People's Control Committee, F. Krasnikov, Inspector of the Oblast People's Control Committee, N. Chernobrivityev, Head of the Machine Building Sector of the Zaporozh'ye Municipal People's Control Committee, Zh. Yakovleva, Electric Machine Plant Engineer and ex officio inspector of the Municipal People's Control Committee, L. Yudavina, Correspondent of RABOCHAYA GAZETA: "How the Machine Tool Operates"]

Text A problem for a primary-grade pupil: a shop, according to plan, turns out a certain number of parts; so many are manufactured at one machine--how many machines are needed for the shop to fulfill the plan? After a minute's thought, a pupil will give the exact answer. Such a determination of the necessary quantity of equipment is, certainly, fraught with many errors. A primary pupil is not yet taking into account the fact that in a shop there is also a need for machines at which there is no direct manufacture of production items but where, rather, parts are turned out for equipment maintenance and for accessories for high-efficiency work, and so on. Such a problem is within the abilities of an eighth-level student, however, not to mention skilled workers with average and higher education. Surely, they would be justifiably insulted if someone were to propose that they solve such a trifle.

Such "children's puzzles" are, however, not always being solved correctly in production. And the fault here does not, of course, lie in ignorance of the rules of arithmetic, but in basically paying no attention to them. How many machines, let us say, does the Zaporozh'ye electric locomotive maintenance plant need? It is doubtful whether anyone would give a convincing, scientifically-based answer to that question. Even if only because of the fact that norms for the use of machine stock are generally

lacking here, and a lack of the equipment necessary to fulfill schedules is not absent. Therefore, 105 machines--a huge arsenal--are often being fully utilized. Even according to data, enterprises--in 1977 only--are not managing up, and the machine work load of equipment complained no more than 1.68 as opposed to 1.77 in 1976.

Unfortunately, however, some in machine tools can also be observed at other enterprises. Thus, in the Minskspol' Machine-tool Plant only 100 units, out of 177 semi-cutting lathe units, 100 are idle during the 1978 shift on inspection day, and 319 stand idle on the second shift. Intra-shift work stoppages are not at all unusual, and are organization--ab-
sence of materials or parts, lack of tools and acces-
sories, untrained maintenance and equipment of machine opera-
tors. Unforeseen stoppages, however, are formulation,
because at this plant it is impossible to say or at any
hour due to the lack of any flexible manufacturing schedules for
major and minor repairs are not addressed the out of 43 machines,
according to plan, 14 were repaired. The take up for Lt. 21 were
returned to service while the head machine's work is not con-
cerned with repair. In 1978, the equipment spends in
maintenance. This is a very important fact that over the course
of 3 years the work shift equipment at the enter-
prise fell from 1.30 to 1.20.

And things are just as bad, when we get around to the use of high-precision equipment. Even machines with digital program-
ming control and machines of the type "Manufacturing center." Today, the output rate of 300 units per enterprise is very low.
As a rule, these are the tools were in use. One can only
be amazed that such a value adds little to the workers. Machine
tools with digital control of output work for 2 to 4 hours
a day at the plant "Minskspol", while the main plant of
the "Preobrazhensk" Association equipment has 5 to 10
percent usage.

As in every new job, there are some difficulties. A serious
problem for any enterprise is the equipment and maintenance of
new machine tools. Right now, installations are conducted
by primitive methods. The pads of great labor costs and
equipment idle time. Quality control specialists, adjust-
ers, machine-tool operators--the introduction of new technology
are also lacking. In 1978, 178000--these specialists is not,
as a rule, provided for in the courses of study at enterprises.
The lack of specialists is very concerning when explaining this.
They ought to be provided in the work of the service organ-
ization for the industry as well as the motor works plant.

Here, more than 200 machine tool units with digital programming control are already being successfully utilized: screw-cutting lathes, milling machines and others. Single-type grouping by sections is what enables one worker to service 4 to 6 machine tools. This means that the productivity of equipment and the efficiency of machine operators' work rose appreciably. A computer determines the work schedule of equipment, so that the development of new parts occurs in condensed time-spans--approximately in a month.

What then, is to be done with enterprises lacking scientific personnel, computer technology, and where custom-made equipment stands idle without putting out production? It appears that the time of immediate need has come for the creation of a single center for adjustment, maintenance and computer-programming for machine tools in the oblast. This center should also become a place for re-training of working personnel and for the manufacture of spare parts for equipment. The task of "more rapidly renovating the stock of metal-working equipment" was clearly formulated at the November 1978 Plenum of the CPSU Central Committee. More and more new technology is coming to plants. Therefore, care must be taken just now to avoid its becoming unemployed capital and to see, rather, that it provides immediate output.

As is well-known, periods of service for machinery largely depend on its care and on timely accomplishment of preventive maintenance. This maintenance is, however, not meeting the need everywhere. The need for introducing maintenance methods, for significant consolidation of facilities and for better work organization has now arrived. Meanwhile, at oblast machine-building enterprises units at large-capacity maintenance shops were counted--at the Zaporozh'ye motor-works enterprise and at the "Kommunar" motor vehicle plant. Maintenance service was customarily dispersed among shops where crews were small in number and where there was obsolete equipment and limited means of mechanization.

Here, once again, the motor-workers' know-how may become useful. There was a time when even there, machine tools were detained in maintenance due to lack of parts--they began to make them after delivery of equipment to the repair shop. Now, a network schedule of maintenance for a half-year in advance has been worked out. This means that the possibility of preparing in advance technical specifications, spare parts, special technological outfitting and tooling for upcoming repairs has arisen. A schedule chart is established for each machine tool: on it are determined deadlines for preparation of technical specifications and spare parts--absolutely everything is

figured, right down to the date of the machine tool's delivery to maintenance and its leaving maintenance. In addition, more than 200 manuals of standard technological repairs have been developed, and norms for expenditure of spare parts have been worked out.

The industrial method of maintenance can also be adopted at the "Dneprospetsstal'." Here, they have their own "hobby," the application of high-alloy hard steel coatings on worn machine tool parts. Scientists of the Zaporozh'ye Machine-Building Institute became assistants of plant personnel in this matter. Scientific personnel of the departments of machine tools and implements and of welding manufacture and equipment have, incidentally, been maintaining close communication with a number of enterprises for 4 years already--with the abrasives combine, with the flame-prafting plant and with the Zaporozh'ye State Regional Electric Power Plant--and have been exploring better ways of utilizing equipment.

Thus it is necessary that advances which have been put into practice by certain enterprises become the resource of all plants. With the creation of a single machine tool stock maintenance center, this problem could thereby also be solved.

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METALWORKING EQUIPMENT

IMPORTANT ADVANCES ACHIEVED IN USE OF COMPOSITE MATERIALS

Moscow EKONOMICHESKAYA GAZETA in Russian No 10, Mar 79 p 14

Article by S. Kishkin, Academician, N. Yenikolopov, Academician, and I. Fridlyander, Member-Correspondent, USSR Academy of Sciences: "Towards Heights of Ruggedness"

Text The stronger the material, the lighter--in principle--the structure. Any construction engineer or materials authority knows this. Among the credits due scientists there are many achievements in the development of high-strength steels and aluminum alloys. It is sufficient to say that the strength of new grades of steel is almost 15 times greater than that of iron, while the strength of certain aluminum alloys exceeds that of pure metal by approximately 10 times. In addition, new aluminum alloys with auxiliary casting are not inferior to standard ones in dependability but are 10 to 12 percent lighter, which greatly facilitates lowering the weight of a construction.

At the same time, the constructional strength of joints made out of new alloys or grades of steel may be significantly less rugged than that of laboratory models using these materials. This is explained by the fact that, with an increase in strength, materials' sensitivity to a concentration of stresses increases, and the danger of corrosion growth as a result of stress increases. The probability of cracks' appearing becomes extremely high. In worldwide practice, there have been cases where an extreme increase in the strength of a gas main led to an accident, as cracks of explosive nature to the extent of several kilometers appeared in the "thread" of a pipeline. All of this attests to the fact that possibilities for further increase of the durability of steels and aluminum alloys are decreasing.

WHAT IS A COMPOSITE?

What materials, then, can take their place? Optimum crystals, it turns out.

Science. It is now known that solid silicon carbide has a grain size of 10,000 microns, and with a wire diameter of 0.001 in., a mechanical strength of 30,000 lb. per sq. in. is obtained.

Achieving a grain size of 100 microns is a difficult problem, but a number of successes have been achieved in the use of various methods of synthesis. The best is being achieved in silicon carbide fiber, which is being used in massive articles, such as engine cylinders, valves, filters, threads and so on. The fiber consists of small silicon carbide crystals called "whiskers" which are 100 times sharper than steel. The fiber is reduced, and the temperature of the fiber is increased.

There are two main types of fiber: the "whiskers" and the "filaments." The whiskers are the most difficult to produce, but they are the most useful. The filaments are the easiest to produce, but they are not as strong as the whiskers. As a result, the whiskers are used in the production of fiber.

Let us now consider the properties of the fiber. The fiber is composed of two main parts: the "whiskers" and the "filaments." The "whiskers" are the most important part of the fiber, as they are the strongest and most durable. The "filaments" are the weaker part of the fiber, but they are also important, as they are used to bind the "whiskers" together.

The "whiskers" are composed of silicon carbide, which is a very hard and brittle material. The "filaments" are composed of silicon carbide, which is a very soft and ductile material. The "whiskers" and the "filaments" are combined to form a fiber.

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Of much more importance, however, is the fact that their strength reaches 4,000 kilograms per square millimeter, that is, tens of times greater than that of any metal. Unfortunately, from "whiskers" it is impossible to get monolithic solids with similarly high strength after combining them into a single whole with the aid of a plastic matrix. Also extremely complicated is the very problem of making a reliable bond of the "whiskers" with a matrix.

Unbroken wires and fibers are giving good practical results. They, like the "whiskers," need to be connected by a plastic matrix. They possess an undoubted advantage--linear continuity. On an industrial scale, wire from high-strength steel and refractory heat-resistant metals, carbon fibers, boron fibers, silicon carbide, aluminum oxide, glass fibers and fibers of organic compounds are contained via a metal (aluminum, magnesium, titanium) matrix and a resin matrix (a polymer matrix). But there are also inhomogeneous composites; for example, there is graphite--a carbon composite with graphite fibers joined by a graphite matrix. This composite material differs advantageously from monolithic graphite, which is very fragile and breaks under the slightest load. Graphite to graphite has a high degree of heat resistance and thermal conductivity.

A New Composite

Recently, a composite has been obtained from two fragile solids, glass and aluminum oxide, in the form of a composite material made out of fibers of aluminum oxide with a glass matrix. A sufficiently tensile composite material is formed as a result. At the same time, it possesses a high degree of strength, chemical stability and heat resistance. However, glass fibers have a relatively low modulus of elasticity. And, although encouraging results have been had in laboratories in connection with the use of the glass of elasticity of glass fibers, organic fibers, such as carbon, boron, silicon, aramid, especially aramide, fibers, can, however, be joined not by a glass but by a polymer matrix.

These materials are often termed "materials of the future." They are called so because they are already used in aircraft construction, giving substantial advantages in strength, durability and resistance to corrosive and chemical agents.

There are also composites of glass-plastics, manufactured by the methods of fiber glass used in large quantities in machine building. They give operational benefits no less than those of metal. In comparison with the strength of high-strength steels, they have

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One of the important problems of modern machine building is that of increasing materials' heat resistance. Its solution facilitates the creation of cast alloys with controlled crystallization and similarly facilitates the reinforcement of nickel and cobalt alloys with fibers of high-melting metals (molybdenite, tungsten, and with particles of high-melting compounds (oxides, nitrides, carbides). Thread-like crystals--"whiskers"--or carbide with a diameter of 2 to 3 microns possess a strength of up to 1,000 kilograms per square millimeter. They are not introduced from the outside but are formed during the process of controlled alloy crystallization, creating a high-strength material exceeding the well-known heat-resistant alloys. The whiskers of cast alloys with controlled crystallization permit a rise in the temperature of gases in turbines to 1,100 degrees, which substantially increases the thrust of the largest types of gas turbine engines.

intensified work being conducted on the widespread application of aluminum materials, particularly materials reinforced with carbon fibers. In automobile construction, in the making of cars completely made up of composites—including the chassis, vehicle body, drive shaft and so on. It is presumed that the weight of such a vehicle will be reduced a third and that fuel consumption will also be greatly reduced.

Unusually, since modern bicyclists--including competitors to a-
chieve 100 m.p.h. speeds, tennis rackets and other sporting goods
are made mainly of woven carbon plastics. There is one
exception, the 100 m.p.h. line, of carbon plastics, that of casings
for cameras. Even in recent players, sound recorders and
radios, the widespread use of carbon plastics presupposes
the use of carbon fibers.

METALWORKING EQUIPMENT

CALL FOR ORGANIZED MACHINE TOOL REPAIR IN KISHINEV

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Jun 79 p 2

Article by V. Pilatov, Deputy Chairman of the Moldavian SSR Gosplan, Kishinev: "Improving the Mechanism of Management: The Machine Tool in Repair"

Text It is a most common situation: a lathe has broken down. What is to be done? It would seem necessary to send it to a specialized plant for repair. But nothing of the sort. There are few enterprise managers who would not prefer to at least try to get by on their own. No matter what the cost. Look around the repair shop of any machine building plant. Judging from the list of tasks that are performed here, such a shop could almost manufacture the lathe itself. Could. But at what price?

Our specialists have studied the practice of repairing equipment at 40 Moldavian All-Union enterprises (primarily machine building). 4,600 units of equipment are used at these enterprises for repair. There is no need to speak about the quality of this utilization, for no one is really asking about this. More than 4,200 generally highly-skilled specialists are employed here. Today there are almost a third more of them than there were, for example, three years ago.

As compared with 1975 the amount of repair work at the enterprises that were studied has increased significantly. The total expenditures for it have doubled, the volume of work has increased 2.4-fold and the amount of floor space devoted to it has been expanded substantially.

In a word, there has been growth in all directions. Except in the quality of the repair work.

Unfortunately, this is the case. Repair work and the manufacturing of spare parts almost always deviate significantly from the requirements of technology and the technical specifications. And how can these deviations be avoided when the material-technical base of the repair services at the majority of enterprises does not make it possible for them to handle things at the necessary level and with small expenditures. Most of the work is done manually. In such shops there are constant complaints about the lack

of machine tools, particularly specialized machine tools. Even increasing the amount of equipment does not have a significant result, because the quality of the repair work is low, the enterprises do not have highly-skilled personnel and there are no tools and accessories.

Here are some other consequences of the principle that "each person is his own repairman". In the face of a sharp shortage of workers, approximately four million men in our national economy are engaged in repairing all kinds of equipment, for which a fourth (!) of the entire park of Soviet metal-cutting equipment is used. The number of workers employed in repairing and servicing metal-working equipment alone is nearly four times the number of workers employed in manufacturing this equipment.

It is felt that the conclusion is evident: this course simply cannot be pursued any further. What other course can be taken? There is no need to look for it because it has been found long ago - the centralization of repair work. This is the goal that was pursued in establishing the All-Union Industrial Association Soyuzstankoremont [All-Union Industrial Association for the Repair of Machine Tools] within the system of the Ministry of Machine Tools and Tool Building Industry.

It is a very good idea. One organization, that has a network of well-equipped enterprises, is tasked with the restoration of equipment that is used throughout all industry. This removes a heavy burden of expenses and misunderstandings, which together create a sense of disconnectedness. In this scheme of things the idea needs no discussion. The difficulties, with which the accomplishment of the idea is fraught, are also understood. There is even some joking about creating an entire subsector of the economy!

But isn't the switchover of industry to the rails of centralized repair proceeding at too slow a pace? Just over two years ago the chief of Soyuzstankoremont cited the following figures in the pages of SOTSIALISTICHESKAYA INDUSTRIYA: the association's plants are able to accept for capital repair work throughout the USSR 1.6 percent of all equipment in need of repair. That is just a drop in the bucket!

What has changed since then? If one judges on the basis of machine building in Moldavia, then these changes have made very little impact. The republic's enterprises manage to make use of Soyuzstankoremont's services for only the restoration of jigs and precision machine tools; for the repair of the biggest universal equipment they must as before rely upon themselves. One can count on one finger the enterprises that do business with the most convenient plant, which is Yuzhremtanok (in the city of Kotovsk, Odessa Oblast). And it isn't because there is no need. The problem is that the facility is too small and has an inadequate base.

The creation of a sound exchange fund would be a great help. It is a very progressive matter. It is especially attractive for enterprises that do not have a large equipment park and where each unit is in use. When the enterprise sends over a machine tool it receives the very same piece of equipment in exchange, only in operating condition, of course. The convenience of such

a system cannot be overestimated. At Soyuzstankoremont's plants such a fund is being created for a group of lathe, milling and drilling machine tools. I have again checked the data for the years 1977 and 1978; we, alas, have not managed to evaluate the advantages of this system. Meanwhile, the republic's machine building is experiencing its greatest difficulties with just these groups of equipment.

Least of all would I wish to make claims against the association. I repeat that the problems connected with its coming into being are very complicated. However, for me to sit idly by until it becomes a real force also serves no purpose. Time marches on. The expenses increase not by days but by the hours.

It is felt that it is necessary to create a new subsector through our joint efforts. Just as we are centralizing the assets of enterprises through their shared participation in the construction of common communications and common industrial construction projects, etc., we must take the same approach to the creation of regional repair plants, with Soyuzstankoremont being included in the role of a general customer. The assets for this are available. It is not difficult to reach this conclusion after analyzing the dynamics of expenditures for the development of the repair services of these same machine building plants.

It is time to give careful consideration to another (not an alternative, but a parallel) variation - an association of repair capacities on the basis of existing enterprises of the Ministry of Machine Tools and Tool Building Industry. Such a collectivization would make it possible to create powerful shops for the repair and servicing of equipment, to equip them with modern diagnostic equipment, specialized technological and monitoring equipment, to create within them stores of spare parts and an exchange fund of machine tools which are most widely in use.

Let no one be intimidated by the departmental subordination of such centers. How does it turn out with automobiles? Having received an order for the repair of its vehicle, an organization appeals to an automotive repair enterprise. And there they do everything necessary for the vehicle. And here is an even better example - the work of the SoyuzEVMkompleks [All-Union Computer Complex]. This work is structured on just such a basis of regional departments. And are the problems of repairing equipment with digital programming control so much simpler? Nonetheless, we are solving them with old organizational methods - we are diverting a significant number of most highly skilled specialists (if, of course, they are available) and stocking up for the future with expensive electronic units. And just the same we are often unable to do anything. And here as well centralization is vitally needed.

In a word, the improvement of the organization of repair and technical servicing of metal-working equipment must be viewed as one of the basic parts of a total program for raising the efficiency of public production. This is a very pressing problem for each region of the USSR. Particularly at this time one cannot forget about all of this. For the Eleventh Five-Year Plan is being formulated and the control figures for the ensuing five-year plan are being studied.

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